SCIENTIFIC AMERICAN

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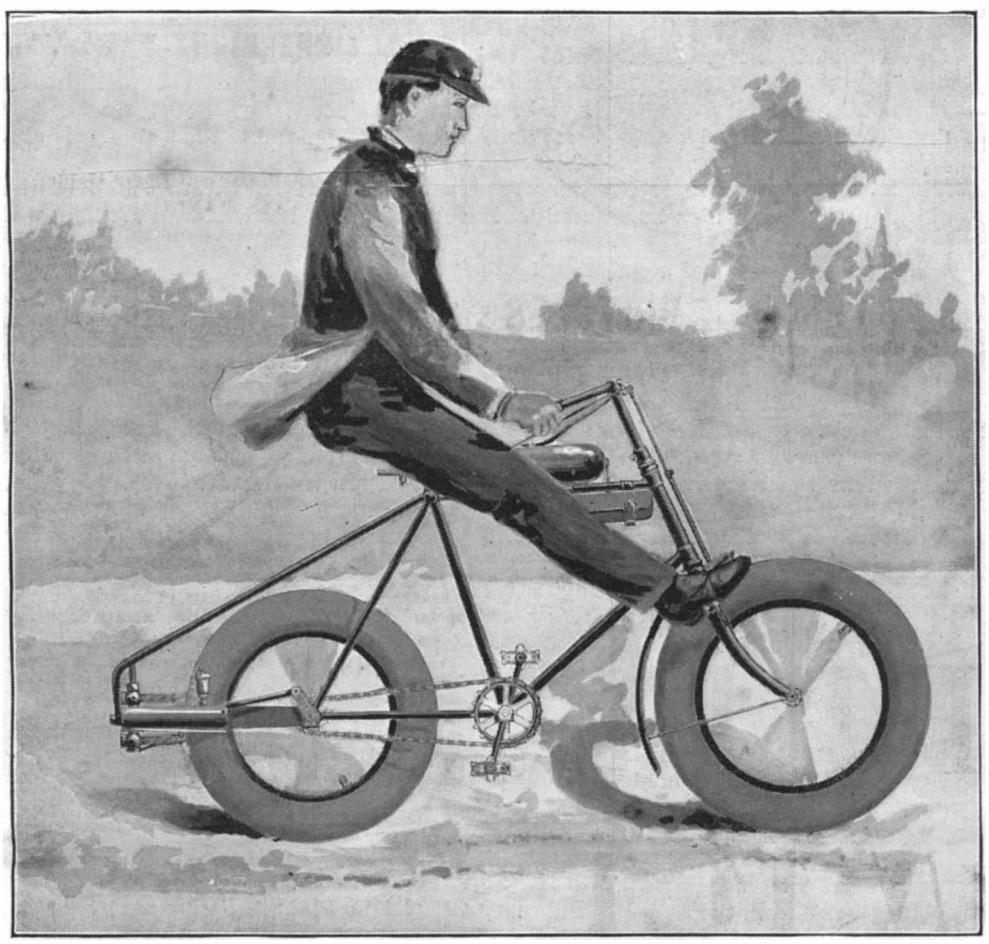
THE NATIONAL BICYCLE EXHIBITION IN MADISON SQUARE GARDEN, NEW YORK.

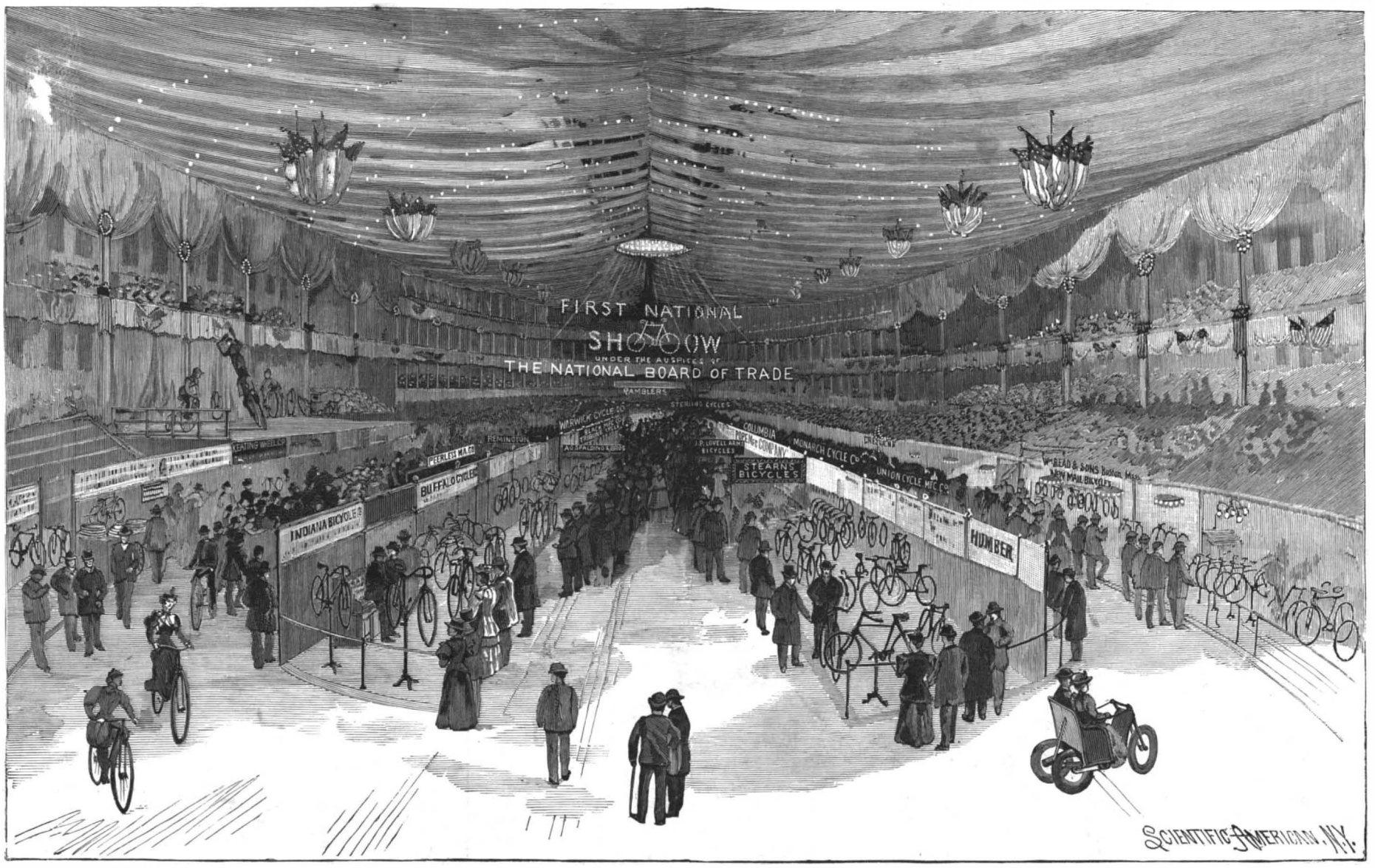
The National Bicycle Exhibition, which for a week was in possession of Madison Square Garden, in this city, in the interest it excited, as shown by the crowds attending it, compared favorably with any exhibition hitherto given there. The best time to see the exhibits was early in the day. As the afternoon progressed, the hall rapidly filled, and in the evenings it was crowded. On entering at the west entrance, if in the evening, the electric bicycle, nearly four hundred

(Continued on page 86.)



THE MOTOR CYCLE.

THE EIGHT POUND FOURTEEN OUNCE TRIBUNE BICYCLE.



THE NATIONAL BICYCLE EXHIBITION IN MADISON SQUARE GARDEN, NEW YORK—GENERAL VIEW.

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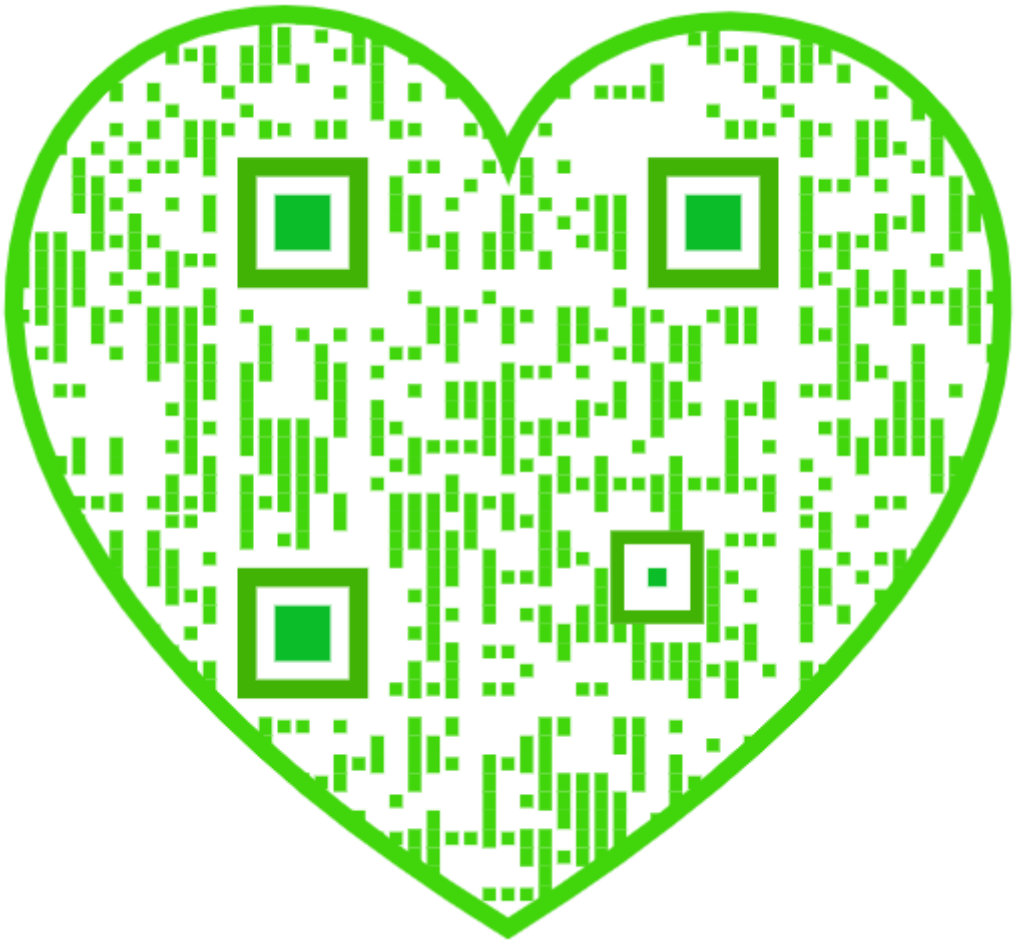

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LESSONS OF A GREAT DISASTER.

The North German Lloyd steamship Elbe, bound from Bremen for New York, was sunk in a collision with a small steamer fifty miles off Lowestoft, England, between 5 and 6 on the morning of January 30.

But twenty survivors escaped in one of the boats. All the other passengers and crew, numbering about 334 souls, were lost. The weather was clear, but cold, and a strong wind, almost a gale, was blowing.

Chief Engineer Neussell, who was saved, says the stem of the steamer which rammed the Elbe struck her about 150 feet forward of the rudder, or just abaft the engine room. The engines were not damaged by the collision, but the water soon poured in, and although the steam pumps were put to work, in about three minutes it proved to be useless. The fires were soon extinguished and the engines and pumps stopped working.

Mr. Keller, the London manager of the North German Lloyd Steamship Company, says:

"The Elbe was struck right on a bulkhead partition, so that both the watertight compartments which it divided were instantly filled."

There was no longitudinal bulkhead.

The shock and crash of the collision aroused everybody. The steerage was in a panic in a moment, and men, women and children, half dressed, or in their night clothes, came crowding up the companionways to the deck.

As the other steamer backed off and drew her stem out of the great cut made in the side of the Elbe, the latter careened over to port and began to settle by the stern. Three boats on the port side were lowered, but all except one were lost. By this time the list of the ship to port was so great that the starboard boats could not be lowered; and soon after the ship went down by the stern, and the whole crowd of people on board were engulfed in the waves. The single boat with twenty-two persons was picked up by a fishing smack. The colliding vessel was a small steamer from Rotterdam named the Crathie. Her stem was badly crushed, but she succeeded in reaching port in safety.

Among the lessons derivable from this disaster, we may note the inadequacy of the present means of saving life. The Elbe was provided with ten life-boats, besides life-rafts and collapsible boats. In consequence of the careening to port, the five starboard life-boats could not be launched. The life-rafts and other boats appear to have been of no account. Is it not possible for ingenious minds to study out new forms of life-saving devices that shall be available under the conditions in which the Elbe was placed? Cannot some practical system be devised for launching boats from the upper side of a careened vessel?

The weakest spot in nearly all steamers appears to be at or near amidships. A blow near this point has almost always proved fatal. Knowing this weakness, cannot some ingenious mind discover a remedy? Cannot an unsinkable ship be invented? We think it can. We have given in back numbers of the SCIENTIFIC AMERICAN engravings of ships that were cut in two, and yet each part floated. In one of the parts were the engines, boilers and propeller; and this section was still able to navigate, and also tow the other section. This was done at the West when the experiment was made of sending steamers through the lakes to the East. The vessels when intact being too long for the canals, were cut in two, as stated, and after passing the canals, the sections were again united.

The Elbe was built in 1881 by the Fairfield Shipbuilding Company, of Glasgow, better known as the Elder Company. She was the first express steamer built for the North German Lloyd Steamship Company.

She had ten standing life-boats, six collapsing, or folding, life-boats, three life-rafts, and was divided into nine water-tight compartments.

Her dimensions were: Gross tonnage, 4,510 tons; length over all, 418 feet; width of beam, 44 feet; depth, 35 feet. She had two funnels and four masts, which were schooner rigged. Her speed was 16½ knots an hour, and her horse power 5,600.

THE HEAVENS IN FEBRUARY.

An excellent opportunity to see the shy planet Mercury is offered this month. Since the astronomers watched it crossing the sun's face last November, Mercury has passed around the farther side of the sun and is now preparing to swing once more into line between the solar orb and the earth, but this time it will not be seen against the sun. On February 9 the little planet will attain its greatest elongation east of the sun and will be seen shining in the sunset glow low in the west. It should be looked for, as soon after sundown as possible, two or three days before and after the 9th. On that particular day it will be near the fourth magnitude star Lambda in the constellation Aquarius. But what will especially serve to identify it is the presence of Venus. Mercury and Venus will be in conjunction early on the morning of the 10th, and close enough together on the evening of the 9th to make the sight a pretty one. Mercury will be recognizable as the more northerly of the two, the distance separating them being about three degrees.

It will be interesting to remember when looking at Mercury on this occasion that the planet is, at the time, close to its perihelion point or nearest approach to the sun.

It will receive (shall we say enjoy?) a degree of heat ten times as intense as that which the sun pours upon the earth, and yet toward the end of last December the solar heat on Mercury was less than half as great as it will be on February 9. This arises from the fact that the orbit of Mercury is very eccentric, so that its distance from the sun, which is only 36,000,000 miles on the average, varies to the extent of nearly 15,000,000 miles. Luckily for us, the sun doesn't sport that way with the earth.

Every lover of the stars will rejoice at the return of Venus to the western sky. During the month she will gradually draw away from the sun and brighten a little, but she is still far in the distant part of her orbit and the real glory of her re-entry as the queen of the evening is a spectacle reserved for the spring. At the end of February, however, she will already have become a conspicuous object, brightening the barren region that lies on the borders of Cetus and Pisces.

Mars remains in Aries during the first half of the month. In the latter half his eastward motion will carry him over into Taurus and he will swing slowly past the Pleiades on their southern side. His splendor has departed, he is moving farther away, and the sun is getting lower on that southern pole of his, whose snows (if snows they are) sparkled so brilliantly and vanished so swiftly at the touch of summer last year.

But while Mars fades, Jupiter continues a feast for the eyes of all those happy people who know the joys of the telescope. His marvelous panorama of cloud belts and changing spots, the delicate blue of his poles, and the gorgeous decoration of white and ruddy vapors that encircles his vast equator, are sights of another world that no thoughtful person should miss seeing. Jupiter is in the eastern part of Taurus some four degrees northeast of the star Zeta, and almost directly north of Orion; but he needs no star to point him out, and no constellation to emphasize his presence. He crosses the meridian about 9 P. M. at the beginning of the month and about 7 P. M. at the end.

I give, as heretofore, two or three dates on which the shadows of some of Jupiter's satellites can be seen on his disk, eastern standard time:

February 10, at 7:41 P. M., satellite I will pass upon the disk; its shadow will follow at 8:45, and the latter will be half way across about 9:55.

February 22, at 9:19 P. M., satellite III will pass upon the disk; its shadow will follow at 2:08 o'clock the next morning, and the latter will be half way across about 3:38 A. M. In the mean time, at 2:21 A. M., satellite II will disappear behind Jupiter.

February 24, at 8:55 P. M., satellite II will pass upon the disk; its shadow will follow at 11:18, and the latter will be half way across about 12:40 A. M. At 11:21 the same night, satellite I will pass upon the disk; its shadow will follow at 12:35 A. M. and will be half way across about 1:45 A. M.

Saturn is in Libra, some 15° or 16° directly east of the bright star Spica. It cannot be seen before midnight. The same is true of Uranus, which remains near the fourth magnitude star Iota in Libra. Neptune is in Taurus, about 6° northeast of Aldebaran and about 2° in a northerly direction from the fifth magnitude star i.

The opening of the month finds the moon in Aries, in which constellation it reaches first quarter on the 2d, at a quarter past seven o'clock in the evening. The moon fulls in Leo, near the star Regulus, on the 9th, a little after midday, and attains last quarter in Libra at 8 A. M. on the 15th. It is in perigee on the morning of the 9th and in apogee early in the afternoon of the 22d. The coincidence of the perigee with the full moon phase is closer this month than it was in January. This tends to the production of high tides.

The new moon of February will occur just before noon on the 24th.

As the moon runs through the circle of the Zodiac she will in turn pay her respects to the various planets encountered on her way. At midnight on the 4th she will meet Neptune; at 10 P. M. on the 5th she will pass Jupiter, and at 10:36 P. M. on the 14th Saturn will bask in her rays. It becomes the turn of Uranus to meet the swift-footed goddess on the evening of the 15th. Renewing her course in the west, in the last week of the month the moon will pass Mercury, returning sunward on the 24th, and will overtake Venus on the 26th.

GARRETT P. SERVISS.

Antidote for Cyanide Poisoning.

Cobalt nitrate is found by Dr. Johann Antal, a chemist of Hungary, to be an antidote to prussic acid and cyanide poisoning. First he tried the cobalt on animals, and then, presumably at different times, on forty living persons who had been accidentally poisoned by prussic acid, and in all cases the results are reported to have been satisfactory.

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Acetylene as an Illuminant.

The hydrocarbon acetylene C_2H_2 is well fitted for acting as an illuminating agent on account of the high percentage of carbon—92 per cent—which it contains, and because of the fact that being an endothermic compound, the heat evolved in its combustion is greater than that corresponding with the number of heat units generated by the oxidation of its constituents. Save in the laboratory, it has not hitherto been prepared in the unmixed state, and its utilization has not been contemplated, as the ordinary methods by which it can be obtained are comparatively costly. Its qualities as an illuminant are, however, sufficiently good to warrant the supposition that various applications may be found for it, should a cheap method of manufacture be devised. A considerable amount of rumor, couched in exaggerated language, has lately been current concerning the production of acetylene on a scale of sufficient magnitude to bring its adoption as an illuminant within the bounds of possibility. The bulk of the reports have been transatlantic in all senses, and too much regard should not be paid to them, but there is nevertheless a certain core of fact in these announcements which may be profitably sifted out.

The subject being eminently topical, Professor V. B. Lewes has taken advantage of it to deal in a popular manner with the various suggestions that have been made for turning acetylene to account, should it prove practicable to prepare it at a cost which would enable it to compete upon equal terms with other combustible illuminants. The dissertation alluded to was read on January 16 before the Society of Arts, and contains, inter alia, a useful recapitulation of the chief properties of acetylene and of its mode of preparation. It has long been known that certain metals, notably those of the alkaline earths, are capable of forming carbides, which when treated with water evolve acetylene, the hydroxide of the metal used being simultaneously formed. Moissan has shown that only a restricted group of substances can be regarded as fixed at the high temperatures which can be obtained by means of the electric furnace, silicides, borides, and carbides being prominent among these, and many such substances have been experimentally prepared by him. That calcium carbide can be obtained in a like manner is a necessary corollary; in addition to this it has been empirically found that the preparation of this substance can be effected with considerable ease. A mixture of powdered lime and anthracite exposed to the temperature of the electric furnace yields calcium carbide, the lime being reduced to calcium at the expense of a portion of the carbon, the remainder of the latter uniting with the calcium; the formula CaC_2 has been assigned to the calcium carbide prepared in this manner. The sp. gr. of calcium carbide is stated to be 2·262, this low figure being due to the fact that calcium is, next to the alkali metals, one of the lightest of the metallic elements. When calcium carbide is brought into contact with water, acetylene is evolved and lime formed, according to the equation $CaC_2+HO=C_2H_2+CaO$; when excess of water is present, the lime resulting from this decomposition is, of course, slaked. It is seriously proposed to manufacture calcium carbide for the purpose of preparing acetylene either for immediate and local consumption as an illuminant, or for distribution from a central station as the enriching agent in ordinary coal gas, or as the chief constituent of illuminating gas of special grade. A yield of 5 cubic feet of acetylene per pound of calcium carbide is claimed, the gas obtained being very nearly pure—98 per cent C_2H_2. The powerful and disgusting odor of acetylene would give warning of its escape from leaky fittings—a point of some moment, as it is undoubtedly possessed of toxic properties. The solubility of acetylene in water—about 1·1 volume for 1 volume of water—is somewhat against ease of handling and distribution, but the gas is a good deal less soluble in strong brine. It can be condensed to a liquid at a moderate pressure, and its transmission in this form would not be more difficult than that of most other gases which are now commercially obtainable.

There are two reasons why hope may be entertained that the utilization of acetylene as an illuminant may be eventually achieved. The first is that a flame of acetylene is greatly more luminous than one consuming the same volume of any other gas. Taking the consumption of ordinary London gas in a common flat flame burner to be 5 cubic feet per hour for a light of 16 candle power, a similar consumption of acetylene in a burner sufficiently suitable for a gas rich in carbon will give as much as 240 candle power. Weight for weight, the comparison is about half as favorable, for a cubic foot of acetylene weighs about twice as much as one of coal gas. The second point in favor of the realization of the proposed use of acetylene as an illuminant is that calcium carbide itself may be regarded as potential acetylene, seeing that the gas can be generated from it by contact with water. Portable cartridges of calcium carbide, properly protected from moisture, could therefore be used to charge reservoirs into which water could be introduced, and acetylene thereby generated and delivered for consumption by its own pressure. An estimate has been advanced as to the cost of producing acetylene, and may be provisionally transcribed. The cost of preparing calcium carbide in the electric furnace is stated to be £4 per ton, corresponding with an estimated price of £3 10s. for that quantity of acetylene which a ton of calcium carbide will yield, due credit being given for the value of the lime obtained as a by-product. The volume of acetylene given by one ton of carbide is 11,000 cubic feet, and the cost of the gas, therefore, works out at 6s. 4½d. per 1,000 cubic feet. The gas won in this manner has, as stated above, an illuminating value of 240 candle power, and compares favorably in price with oil gas of 96 candle power costing 3s. 4d. per 1,000 cubic feet. It must be noted that the difference, which is about 9d. per 1,000 cubic feet, is not large, and would suffer change of sign if the estimated cost of manufacturing calcium carbide were found to be unduly low. The prospect of acetylene displacing other enriching gases must rest upon a better foundation before it can be termed immediate.

The handling and transmission of acetylene are attended by a curious risk. The gas has the property of forming compounds with several metals, such compounds—acetylides—being eminently explosive. Copper and brass pipes would be liable to yield copper acetylide from this action of acetylene conveyed through them, and to become coated with a detonating film. No similar tendency has been observed with the commonest materials for gas pipes, namely, iron, lead and tin. The precise methods that may prove to be feasible for distributing acetylene as an illuminating gas can only be foreshadowed. One obvious means consists in mixing the gas with air in much the same way as that used for "air gas," made by saturating air with the vapor of a light liquid hydrocarbon, and using the mixture direct as an illuminating gas of high candle power, but not of such richness as to be liable to burn with a smoky flame. Some danger may attend this course, as gross carelessness in adjusting the proportions might result in the production of an explosive mixture. A second, and in some ways preferable arrangement, would be to enrich common coal gas with acetylene in place of gas from cannel or of enriched water gas. The addition of the acetylene could be effected either at the gas works or on the premises of the consumer, who would utilize a local reservoir of calcium carbide. In all these cases acetylene would of course compete with older methods of enrichment, and its cost of production is the only factor that need be seriously considered. Discussion thereupon is useless at present, further and more independent data than those quoted above being requisite for arriving at a valid estimate.

A better chance of putting acetylene to a practical use is afforded by the growing need in many places, and for numerous purposes, of a self-contained source of gas of high illuminating power. The bare fact that a portable solid substance can be caused to generate a gas of the required quality by mere contact with a sufficiency of water suggests numerous applications of this order. Lights of vehicles of all descriptions, including railway carriages, where compressed oil gas might be replaced by calcium carbide and water, signal lights and buoys in positions to which access is necessarily intermittent, and the domestic supply of isolated houses, give considerable scope for a material fulfilling the essential conditions of simplicity, certainty, and safety in use. For purposes of this kind, the question of cost is altogether subsidiary, and the rivals with which a new illuminant would have to compete are themselves handicapped by many disabilities. Should failure attend the more ambitious scheme to use acetylene as a general lighting and enriching agent, a fair measure of success may be secured in the less grandiose direction.—The Engineer.

New Forms of Ice Yachts.

Considerable time and money are being expended this winter in testing new designs for improving the speed and efficiency of ice yachts. The scientific principles involved in the work make it a very interesting line of investigation. The earliest form of ice yachts consisted of a box made of rough boards about 7 feet long and 4 feet wide, provided with three runners and a low-peaked sail. The runners were about a foot in length and were shod with rough iron bands, turned up in front. This form, however, was discarded forty years ago. The next improvement consisted in adding a set of runners about 3 feet in length, shod with smooth, sharp irons. The sail was next replaced for one which was more peaked, and in time a jib sail was added. Next came the use of four runners, arranged in pairs.

During the past ten years all the ice yachts have been of the three-runner type, and formerly where the frames were built to carry ten people they now accommodate but two. The wooden yachts are built on the cockpit plan, and consist simply of several straight parts known as keel, on which are attached the cockpit, runner plank, and spars. The runners of the modern yachts are very expensive. They are packed away carefully in boxes when not in use, to keep them clean and bright. They are made in a peculiar shape, the top being formed of oak and the shoe of cast steel, bolted securely to the wood. A set of runners weighs from 200 to 500 pounds, and costs from $50 to $200. Ice yachting has come to occupy in recent years a position of great prominence. On the Hudson and the Shrewsbury Rivers, where the winter regattas are usually held, many thousands of dollars are invested in ice yachts of a surprising variety of sizes and designs.

Mouth Hygiene.

The care of the patient's teeth is a matter too often neglected by the medical adviser, principally no doubt because of the important position the dentist now occupies in relation to every well-to-do family. The vast majority, however, of those seeking medical advice never go near a dentist unless for the purpose of having a root extracted. School children, the inmates of homes, asylums, prisons, and even hospitals are shamefully neglected in this particular. In most public institutions not only is the tooth-brush unknown, but it is almost an impossibility to secure proper cleaning of the teeth even in those taking mercury, for instance, where the danger of salivation is much increased by this neglect. Many institutions have gentlemen of the dental profession connected with their boards, but the teeth are much more apt to be overlooked than any other portion of the economy, and their every-day toilet slighted. It is, indeed, not an uncommon experience to find those who in health never omit the morning brush, go for days and weeks together without proper mouth cleaning when they are sick—the time above all others when the brush is most required. Of course, if the patient is too ill, an antiseptic mouth wash may replace it in a measure. A little volume of popular essays on the care of the teeth and mouth has just been published by Victor C. Bell, A.B., D.D.S., and we mention it here, not because of any new ideas or theories it embodies, nor because of its literary merit or beauty of illustration, for many things are more attractive than casts of irregular teeth and pictures of false sets. Such information as it contains, however, is most important for all to know, and if the advice given were followed, many a pain would be spared and many a tooth saved.

The proper care of the teeth of school children is receiving more attention in England than it formerly did, and no little credit is due to Dr. Cunningham, of Cambridge University, for his efforts in behalf of school children's teeth and his contributions on this subject to the Seventh International Congress of Hygiene and Demography, and his essay on oral hygiene, for which he was awarded the gold medal prize at the International Dental Congress held in Chicago during the World's Fair.

This gentleman says that parents and schoolmasters pay so much more attention to the quality of the child's food than they do to an efficient dental mechanism for its mastication, because of their ignorance of its importance and of the advantages, both economic and educational, to be derived from adequate attention to the teeth.

In speaking of tooth powders he says, "The principal action should be mechanical rather than medicinal. The power should be very finely grained and should contain no cuttle-fish powder, no powdered oyster shells, no pumice powder. It should consist of alkaline substances and contain no acid ingredients, nor such as are capable of changing to acid in the mouth. All fermentable substances such as carbo-hydrates are contra-indicated." He agrees with Miller, that precipitated chalk should form the basis of a powder, and also recommends a dash of neutral or slightly alkaline soap. He also considers a tooth soap preferable to tooth powder.

The physician needs not to be told how great is the necessity to the economy of sound teeth, nor need we enumerate the pathological conditions traceable to their decay; but all must admit and regret the shocking lack of general information upon this important subject, and the need for instruction, especially in the schools. We commend therefore the diffusion of knowledge concerning teeth, and if the woodcuts of artificial upper dentures, interdental splints, cleft palates, obturators, and drills contained in Dr. Bell's book will have the effect of frightening people into an early visit to a dentist, and if infants will gaze upon irregular dentition as depicted upon page 61, and never after suck their thumbs, much will have been gained for the cause of mouth beauty as well as mouth purity.—Medical Record.

Divided Lens Telescopes.

A Chicago man has lately brought forward the idea of making refracting telescopes of very large size—object lens, say six or more feet in diameter—by setting a number of small lenses in a frame, and grinding all down to a common focus.

This plan of making a divided lens is very old. It was illustrated in the SCIENTIFIC AMERICAN of August 16, 1873.

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PONT-Y-PRIDD BRIDGE, SOUTH WALES.

BY LLEWELYN WILLIAMS, ARCHITECT.

The ancient bridge shown in the accompanying illustration spans the river Taff at Pont-y-Pridd, about 12 miles northwest from Cardiff, S.W.

It was built in the year 1755, and was used continually for a period of about 100 years, when, from the increase in traffic, and the steep inclinations to the center, a new bridge was deemed necessary, which was built alongside the old one.

The old bridge has an interesting history, being the third one built in a period of about eight years. The first, a structure of three arches, was washed away by a great flood two years after its completion; the second was similar to the one illustrated, one arch, which, however, collapsed shortly after the false work was removed, owing to imperfect design.

Its builder, Mr. William Edwards, was not daunted by two failures, although compelled to replace each one at his own expense.

The third one, now standing, has a clear span of 140 feet, and is 75 feet high in the clear above low water, built of a hard, close-grained sandstone found abundant in the neighborhood.

For beauty of outline and general grace of design, this bridge was considered a wonder in its day. There was perhaps no other of so great a span in Great Britain, exceeding even the Rialto, at Venice, by 42 feet.

Mr. Edwards was a self-taught man, of great natural genius, never having received any education except the little gained from a country school. His technical knowledge and engineering skill was all acquired without the aid of books or teacher, in the positive school, although costly, of daily experience.

While but comparatively young, he was his own draughtsman, engineer, constructor and superintendent, and besides found time to fulfill the duties of minister to a church for a period of forty years.

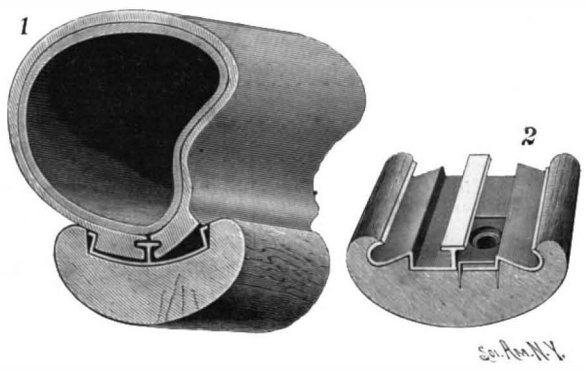
He soon discovered the cause which caused the collapse of his second bridge. It had too great a weight on the quarters near the abutments, causing the central portion of the arch to lift, thus letting down the whole structure.

To avoid this in this third bridge, he conceived the idea of perforating the solid haunches with three cylindrical arches, on each side, each being 9, 6, and 3 feet in diameter respectively, reaching clear across under the width of the roadway, thus relieving the excessive weight, fatal to his last bridge, and crowning his labors after eight years of misfortune with complete success, a monument of his indefatigable perseverance.

Mr. Edwards built many other bridges of nearly equal span in England and Wales, in all of which, when a long span was found necessary, he utilized the same principle of perforating the haunches, to lighten the load. His work still stands solid, and unsettled, by the storms and floods of about 150 years, examples of masonry worthy the emulation of our modern mechanics.

AN IMPROVED BICYCLE RIM AND TIRE.

The rim and tire shown in the illustration are of strong and simple construction, and designed to facilitate mechanically uniting the pneumatic tire with the rim, while the arrangement is such that the wheel may be used whether the tire is inflated or not. The improvement affords the subject of a patent granted to Mr. Lewis A. Erickson, Stromsburg, Neb., Fig. 1 illustrating the application of the invention and Fig. 2 representing a different form of wood rim with metallic band inserted and with the socket for spoke nipple, through which the air is forced into the tire. The wheel has the usual separate air tube surrounded



ERICKSON'S BICYCLE RIM AND TIRE.

by a strip of canvas attached to the exterior rubber tube, the ends of the canvas folding around cushioning projections on the bottom of the tire. These projections may also consist of wire springs, around which the loose ends of the canvas are folded, and they fit into recesses in a metallic band or casing in the top of the rim. This band has in its middle an annular T-shaped rib securely holding and mechanically fastening the tire to the rim, in such way that it is not liable to become detached should the tire become accidentally deflated.

The Water Supply of Rome.

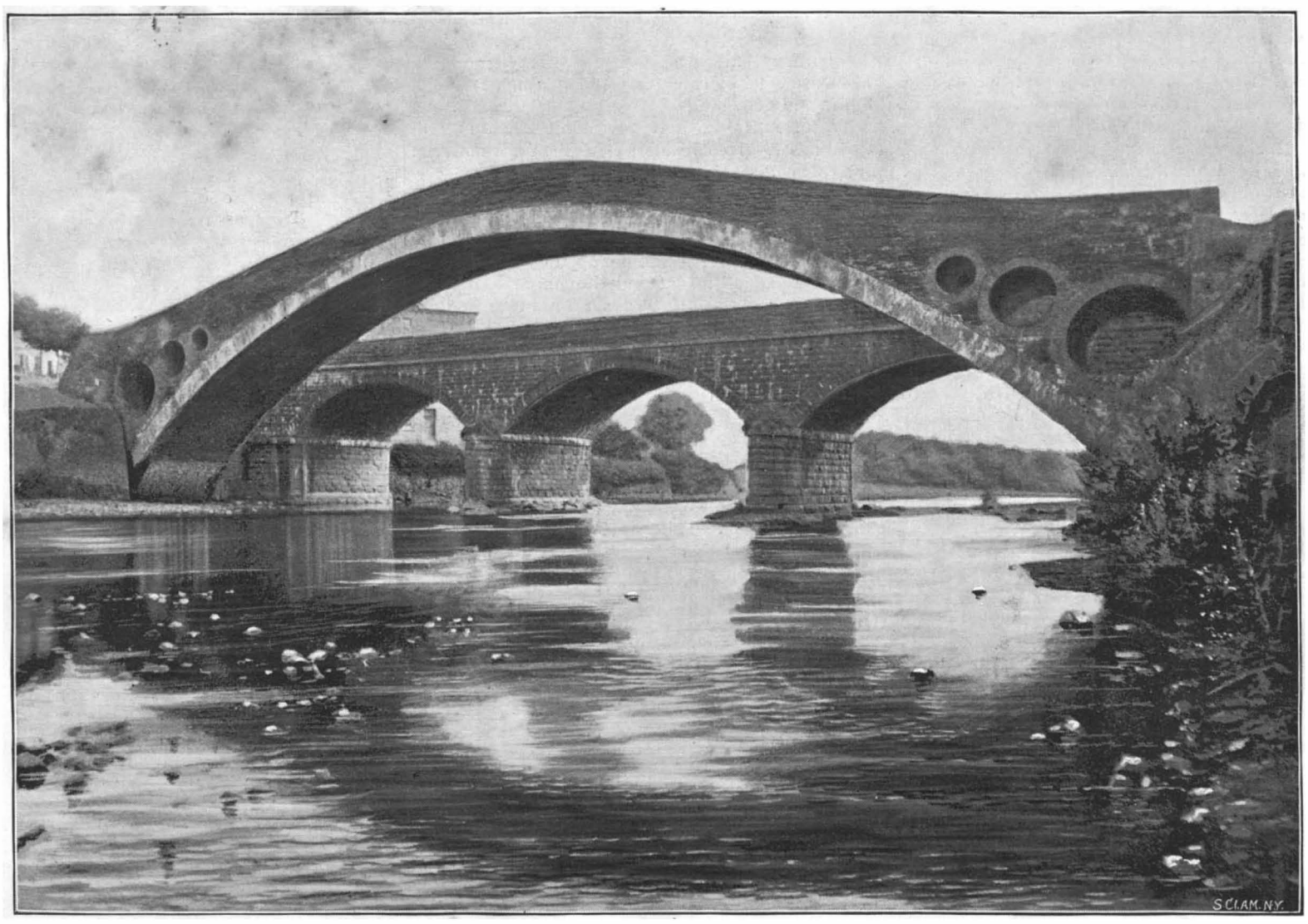
Modern Rome is supplied by four aqueducts yielding the plentiful daily supply of 600 liters a head. A good deal of this water goes to supply fountains—the amount going to one alone, the Fontana Trevi, being sufficient to supply a respectable community. Though it is delightful and refreshing to see the numerous fountains playing, the idea strikes one that perhaps it would be better if a little less water played in the fountains and a little more were used in the households and on the persons of the people. How far behind the ancient Roman cities are in this respect our modern ones all over the world! What is Rome of to-day with its four aqueducts and occasional fountains to the Rome of the year 330, which could boast of 19 great aqueducts, 11 thermae, 856 baths, and 1,352 fountains? The thermae of Caracalla alone were capable of accommodating at one time 1,600 bathers, and we need but to see the magnificent ruins that remain of a few of these baths, or of the great aqueduct running in various directions over the broad surrounding campagna, to realize how the Romans loved pure water and plenty of it. The water supply of to-day is plentiful enough to keep the sewers well washed out. Three main sewers or collectors have been built of late years along the banks of the Tiber, two on one side and one on the other. These sewers empty into the Tiber some kilometers below the city. The banks of that stream, once in picturesque disorder, are being altered by extensive embankments, averaging 14 meters in height and built of fine large quadrangular blocks of travertine. The cost of the embankment wall is paid for at a certain rate a square meter. The sum of one hundred million francs was voted by the government to defray the expenses of the great alterations made along the course of the Tiber. The ancient Cloaca Maxima has not been condemned—it will go on as of old emptying its contents into the golden Tiber—modern experiment having proved that its relatively small contributions are rapidly rendered harmless by dilution in the stream.—Geo. H. F. Nuthall, M.D.

A Curious Case of Combustion.

Dr. Lindsay Johnson writes to the British Medical Journal regarding a patient for whom he ordered ordinary chlorate of potash lozenges (B. P.) which were kept loose in the waistcoat pocket for convenience. Without thinking what he was doing, he put an unopened Swedish safety box of matches into the same pocket. While bending down to pick up something on the floor the lozenges rubbed against the friction paper on the outside of the box. This set the entire box alight, and the heat kindled all the matches in the box. The lozenges added fuel to the flames. The result was that the gentleman was instantly in flames, the combustion being of explosive violence. He was severely burned. Dr. Johnson thinks that it might be well if a caution were to be printed on the bottle or box in which the lozenges are sold to the effect that they should in no case be carried loose. With this recommendation we entirely agree. This is not the first occasion we have recorded accidents like the above, and Mr. Alden's alarming story about the disappearance of two men who used chlorate of potash lozenges is enough to make all druggists regard these apparently harmless and nasty sweets with greater caution than they do.

Postal Rates—A Correction.

In our issue of January 26 it was stated by mistake that under the new foreign postal rates the charge for printed matter would be but 1 cent per pound. The rate for the United States, including those for Canada and Mexico, on second class matter, is 1 cent per pound; but for foreign countries, the rate on second class matter, under the new postal rates, is 1 cent per 2 ounces.



PONT-Y-PRIDD BRIDGE, SOUTH WALES.

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A Large Alternator.

A large alternator, the great size of which has been rendered necessary by the conditions under which the machine is to be worked, and particularly the low speed, is now being constructed by the General Electric Company at Schenectady. This alternator, which is to be installed in the station of the Edison Electric Illuminating Company at St. Louis, Mo., will supply current for incandescent and arc lighting and for motive power purposes. With a view to secure efficient results for these various uses, the generator is being constructed on the "monocyclic" system, which we recently described. This system employs a comparatively low frequency of alternations, and the armatures of the generators have special windings adapting them for use on circuits with self-starting current motors. The alternator in question is of 800 kilowatts capacity, has 80 poles, and is to be driven at 90 revolutions per minute. On account of the great size of the frame, difficulties were expected in producing the castings, but owing to the facilities of the Schenectady works, no trouble was experienced in pouring even the large frame casting. This single piece, made up in part of wrought iron embedded in the castings, weighs 35 tons, and measures 24 ft. over all. The amature is ironclad and is 16 ft. in diameter, weighing nearly 45 tons. The armature will be supported on a 22 in. shaft. The generator will be able to supply, at full load, 667 amperes at 1,200 volts, or the equivalent of 16,000 16 c.p. lamps.

Life Saving Balloons.

The Utica, N. Y., Observer states that Professor Carl Myers has completed at the balloon farm at Frankfort, N. Y., the first of a series of balloon outfits to be supplied to some sixty vessels belonging to New York parties for life saving purposes in case of shipwreck. Each outfit consists of an automatic apparatus generating hydrogen gas under pressure, so controlled by a stop cock that the closing of this immediately stops the generation or flow of gas and retains it still under pressure. This is used to rapidly inflate a balloon of sufficient size to carry a life line ashore from a wrecked vessel, by means of which a heavier cable may be drawn for communication or passage of crew or goods, as now practiced by the governmental life saving crews where stations exist for throwing a line by use of a mortar. The defects of the mortar system are that the stations are infrequent on the coast, the difficulty great in throwing a line against the wind at so small a mark as a ship, and the distance, which frequently makes such efforts futile. The balloon system has the advantage of requiring no special apparatus on shore, while the balloon simply is drifted toward a line of coast by the same wind which blows the ship ashore, and drops its line when the shore is reached.

A REVOLVING ICE CAKE.

To the Editor of the SCIENTIFIC AMERICAN:

There is a curious ice formation on the Mianus River, near the village of Bedford, Westchester County, New York. The Mianus at that place is a small stream, averaging about ten feet in width. At a place locally known as the "ten foot hole" the stream widens out into a pool forty or fifty feet wide. In this pool there has formed a cake of ice about twenty-five or thirty feet in diameter and perfectly circular in shape.

This circular cake of ice is slowly revolving and is surrounded for about two-thirds of its circumference by stationary ice. There is a space of about three inches between the revolving cake and the stationary ice, except at the "up stream" side of the revolving cake, where the water is open and the current quite swift. Each revolution takes about six minutes.

I inclose a rough drawing, which will give an idea of this curious formation. J. M. BATES.

Street Car Fenders.

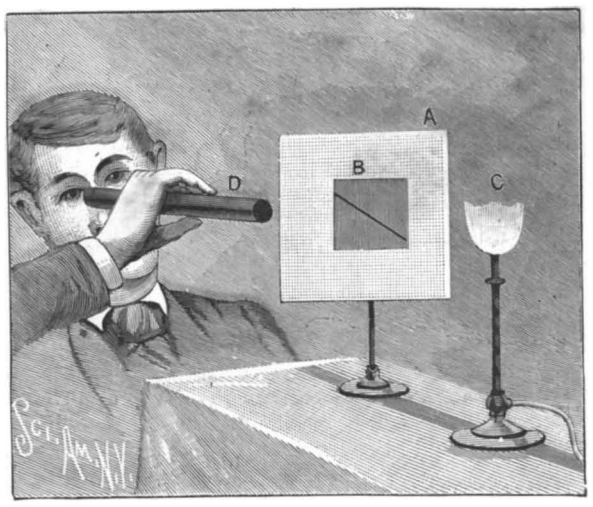
On October 6, 1894, the City Council of Baltimore passed an ordinance compelling the various street railroads of that place to equip all of their cars with fenders before January 8, 1895, or pay a fine of $5 a day for each car not so protected. The ordinance requires that the railroad companies "shall provide for each car or train of cars a car fender or fenders, with both front and wheel guards, of a design which the mayor and city commissioner shall have certified to in writing, which in their judgment comply with the requirements set forth in the report made to the commission appointed under the provisions of the resolution of the mayor and city council, approved April 28, 1894, by Mendes Cohen, engineer to the commission." On the expiration of the time allowed only one company had fully complied with the law, which resulted in the arrest of the superintendents of three lines. They were each released in $500 bail. It is not likely that the trials will result in a conviction, as the railroads involved have proved that they are equipping their cars as fast as fenders can be made.

The commissioners of the District of Columbia are preparing regulations in regard to fenders which require that every cable and electric railroad company in the District shall equip its cars in a satisfactory manner with fenders within forty-five days from the promulgation of the regulations. No special fender is made official, but all fenders used must be subject to the approval of the commissioners.

ON THE MEASUREMENT OF IMAGINATIONS.

BY E. W. SCRIPTURE, YALE UNIVERSITY.

Somewhat over a year ago, I announced the discovery of a method for measuring the intensity of hallucinations. A research on this subject has reached a successful completion, and will soon be made public. In the course of these investigations it occurred to me



MEASUREMENT OF IMAGINATIONS.

that it might be possible to measure the intensity of an imagination also. The experiment was successful. The method is not difficult and is readily intelligible. In order to explain the method, it will be sufficient to describe the first simple experiment made.

The apparatus used is shown in the figure. The screen, A, serves as a frame for a piece of fine tissue paper, B. The tissue paper is illuminated by daylight in front and by a gas flame at the back. When the gas flame is turned down, the eye looking through the tube, D, sees a plain white circle illuminated by daylight.

The first experiment made was on a student accustomed to using the telescope. He was told to imagine hair lines on the white surface, like the hair lines seen in the telescope. This was successfully done. He was asked to describe them and compare their blackness. There is, he said, a horizontal line, which is the blackest of them, and three vertical lines of about equal blackness. He was told that the field of view was to be made gradually lighter by turning on a flame behind, and he was to tell how the lines behaved. As the gas was slowly turned on he described various changes

A REVOLVING ICE CAKE.

in the lines. Finally he said he saw a slant line that he had not imagined before. It appeared just about as black as the horizontal line and blacker than any of the others. Thereupon the experiment was ended.

The slant line was a real line. This he did not and still to-day does not know. On the back of the tissue paper a slant line had been drawn, and as the gas was turned up, of course it showed through. Thus we have a direct unsuspecting comparison of intensity between a real line and an imaginary one.

The photometric determination of the intensity of the real line is not a difficult matter. A phantasimeter has been devised in which the graduation is done beforehand, but the simple arrangement just described serves to indicate the method of experiment.

An Electrical "Nickel-in-the-slot" Gas Meter.

An electrical contrivance has been invented which makes it possible to control the supply of gas from an ordinary gas meter by merely dropping a coin in a slot in the mechanism. The attachment is so arranged that a number of coins may be inserted in a slot, and as one coin's equivalent in gas is consumed, that coin drops into a receiver inside the meter and the next coin in the slot takes its place. In this way the meter can be made to supply gas for an indefinite time by keeping the slot filled with coins. The electrical attachment makes it possible to do away with any complicated arrangement of wheels and levers. The movement is controlled by a simple electro-magnet. When a coin is dropped into the slot the circuit is closed, this excites a magnet, which in turn attracts an armature, and the movement of the armature opens the valve of the meter. It will be seen that as long as the stream of coins is kept up, the meter will continue to supply gas. When the last coin has dropped into the meter the circuit is opened, and this, of course, causes the magnet to release the armature and close the valve. The especial advantage of the electrical over the ordinary mechanical attachment consists in the diminished probability of the machines getting out of order. The contrivance, it is thought, if generally used, would save all the bad debts of gas companies.

Progress of the Diphtheria Cure in France.

The Paris correspondent of the Lancet reports that arrangements have been made at the Pasteur Institute for the immediate dispatch of tubes of anti-toxic serum to any part of France. It will thus be seen that M. Roux and his assistants have not been idle. Indeed, both the institute authorities and the public have worked with a will; the latter having, through the Figaro, and by means of gifts made directly to the institute, contributed up to December 31, 1894, no less a sum than 611,000 francs ($122.200). This does not include 100,000 francs ($20,000) just voted by the Chambers, and which will doubtless become an annual subsidy. The institute now possesses, for immunizing purposes, a stud of 136 horses, a total that will probably be ultimately increased to the maximum of 150. Of these, 20 are kept by the Municipal Council of Paris at a cost of 20,000 francs ($4,000) a year, for the benefit of the Paris hospitals and poor. At Villeneuve d'Etang —a property ceded by the state to M. Pasteur in 1886— there are 79 horses cared for by a capable veterinary surgeon and his staff. That the animals flourish under the regime of good feeding and periodical bleedings adopted is proved by the presence in good health at Alfort of a sturdy Brittany pony which has hitherto supplied no less that 420 quarts of blood.

Photographing Frost Flowers.

At this time of the year, when Jack Frost draws his beautiful ferns and flowers on the window pane, who has not often wished that this beautiful work could be made permanent?

It will be interesting to the professional as well as the amateur photographer to know that it can be made permanent and far more distinct than Jack Frost ever painted them, yet with all the beauty of every line and curve that is found in the original. But one must enter into copartnership with the frost king himself to attain the desired end. It is accomplished by the old wet-plate process. Here is the secret:

The glass plate is flowed with collodion and immersed in the sensitizing nitrate of silver bath in the usual manner. When removed from the bath it is put in the light-tight plate holder and placed where it will freeze. While frozen it is placed in the camera, focused on a white screen and developed in the usual wet-plate way. The plate should be kept frozen till the developer is poured on. Beautiful border negatives can be made in this manner, and no two pictures quite alike. To produce different effects, the holder, when laid out to freeze, should be placed sometimes on end, sometimes on the side, and at other times on the face, flat down. The plate does not require very thorough draining when removed from the bath. Time of exposure in the camera will be governed to suit the artist's taste. Of course, a long exposure gives flat pictures. We have made negatives in one or two seconds that gave prints as distinct as a pen and ink sketch on white paper. We tried it without the use of the camera by a slot admitting a streak of white light into the dark room. The frozen sensitized plate was passed across the beam of light and developed as usual, but the result was not so good as in the camera.—Henry W. Brown, in Min. and Sci. Press.

GERMAN RAILROADS.—The report of the German Railroad Union for the past year shows that the aggregate length of railroads in the union was 45,880 miles. There is a reported increase of 561 miles during the year. Of the entire mileage 11,453 miles or about 23 per cent are double track roads.

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THE NATIONAL BICYCLE EXHIBITION IN MADISON SQUARE GARDEN, NEW YORK.

(Continued from first page.)

feet away and high up on the eastern wall, was seen with its wheels and gear in motion. This ingeniously arranged apparatus was a model of a bicycle thickly studded with electric lamps. It was about 20 feet long and 13 feet high with 8-foot wheels. Some 2,200 lamps were used on the model and on the accompanying signs, as shown in the general view.

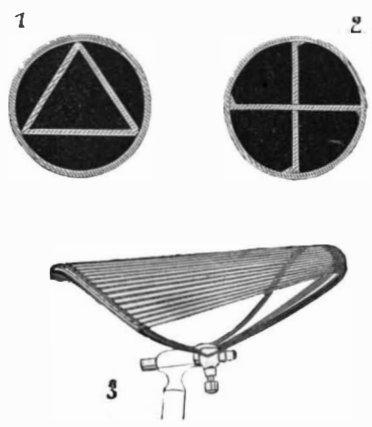
All around the edge of the floor area were spaces filled with exhibits, and four rows of spaces extended up and down the center. The full census showed 163 exhibitors, some of whom were necessarily crowded off the main floor to spaces up among the boxes. The great hall was barely large enough for its contents.

On the center of the north side was a large stage where trick riding and other performances were given, while from another stand an excellent band provided music.

Our large view gives a good idea of the general aspect of the hall when trick riding was in progress on the stage and some of the bicycles were being shown in operation. The exhibits as a rule were mounted on high standards so that they could be examined in all points without stooping. No minor feature of the exhibition was more worthy of commendation than this uniform system of display.

We give illustrations of a few of the more noteworthy things shown. But so much was there, and so many novelties in construction of pedals, cranks, hubs, handle bars and other details were exhibited, that our space is insufficient for more than a suggestion of it all.

In the foreground of our large view is seen the motor cycle in its four-wheel form, while elsewhere we show the single two-wheeler. A tandem two-wheeler with child's seat in front was shown in operation daly. The two-wheeler is driven by a two-cylinder explosion naphtha engine, rated at two horse power. The engine and all appliances weigh 12 pounds. The



FRAME RE-ENFORCEMENTS—THE CLIMAX WIRE SADDLE.

naphtha tank is on the upper brace of the frame. The mixed air and vapor are ignited by an electric spark, the battery for producing which is carried in the tool bag hanging beneath the naphtha reservoir. The front wheels are 22 inches, the rear wheels 20 inches in diameter, and very large tires have been adopted to prevent the wheels from sinking into soft roads. The power is increased or reduced by the rider at will, and a very high speed can be attained. These machines are made by the Hitchcock Manufacturing Company, Cortland, N. Y.

The curiosities of the show included several light wheels, and we illustrate a real wonder in this line, an 8 pound 14 ounce Tribune bicycle, shown by the Black Manufacturing Company, of Erie, Pa. It is full size throughout, having 28 inch wheels and a 43½ inch wheel base. It is only on taking it in the hand that its lightness can be realized. It has 13 ounce M. & W. tires; the tubing is No. 26 gauge (0·016 inch thick) and steel forgings are used for all frame joints. The full number of spokes are used for the wheels, 28 for front and 32 for rear wheel. It has been thoroughly tested by an average weight rider and is doubtless the lightest full sized wheel ever made, being a veritable tour de force. Regular racing wheels are made as light as 15 pounds in weight.

In another cut we show some methods of re-enforcing tube ends. It is at the joints in the frame that tubes give away generally. The Eagle Company insert an extra piece of tube within the other, and cold swage the end so as to reduce the diameter there one-eighth of an inch. The swaging consolidates the outer tube and re-enforcement so that the two are practically one. One figure in the cuts shows the Hoffman re-enforcement with an inner triangular tube, while the Union re-enforcement with interior plates crossing each other at right angles is also shown.

The wire saddle shown in the same cut is one of the greatest novelties in the saddle line which was at the exhibition. A wire frame of the contour of a saddle has spiral springs stretched lengthwise in place of leather, making a very light and elegant saddle, and one which has been used with much success. It was shown on many of the high grade machines, and added to their attractive appearance. It is made by the Climax Manufacturing Company, of East Hampton, Conn.

The exhibit of the Stearns Company, of Syracuse, N. Y., deserves special notice. They claim for their road wheel the narrowest tread, 4 inches, and lightest weight of a large number of other high grade wheels. The narrow tread is the feature of advanced wheels of this year, the great effort being to bring the feet as close as possible, so as to get a direct thrust upon the pedals. This will have its effect in avoiding the knock-kneed appearance often presented by good riders.

A Hurricane at Tillamook Light.

The Seattle Post-Intelligencer gives the following concerning the great hurricane that swept over the sea in the vicinity of Astoria, Oregon, December 9 last.

The lighthouse tender Columbine returned at 6 o'clock this evening from Tillamook Rock, having left for that place this morning to investigate the reported damage to the light from Sunday's hurricane. The sea was too rough to get within speaking distance of the rock, and it was found impossible to land any one by means of the derrick and basket. The Columbine went around the rock several times, and could easily see that considerable damage had been done. The sharp top of the smaller rock, at the south of the main rock on which the lighthouse stands, is gone, and various other places show that huge bowlders have been torn off by the force of the storm. Chief Keeper Pessonen signaled that they were all well, and that he would send his report off in a bottle attached to a buoy. This he did, and it was soon picked up by the waiting steamer. An Associated Press reporter was shown the statement by Lieutenant Blish this evening upon the arrival of the Columbine, and from its contents is learned the full horror of the awful storm on the isolated rock and the dangers the men were subjected to.

Between 11 and 6 A. M. on Sunday last, the worst hurricane ever experienced on the coast raged around the lighthouse. Great mountains of water rolled in from the southwest, and, breaking against the base of the rock, would run up its steep sides and spend their force on the building, which trembled and rocked as if ready to tumble into the raging sea. By noon the storm was on in all its fury, and the seas rolled higher and higher. A great crash of glass shortly after noon told of the damage caused by the waves and fragments of rocks that had been torn loose from the main rock and hurled against the outer glass that protects the costly lenses. Examination showed that the panes were all broken, the lenses ruined and the clock machinery that revolves the light so badly damaged as to render it useless.

The force of the wind and waves can be judged when it is known that the lights broken are 136 feet above high water. A monster rock, weighing perhaps a ton, was hurled upward by the waves nearly 100 feet, and coming down crashed through the roof of the hall and kitchen. The range was ruined, and every movable article in the kitchen was washed away. At one time six feet of water was in the siren room, and four feet in the living rooms. These rooms are eighty-eight feet above high water. Nearly everything in the way of edibles, except the canned goods, were ruined. The cistern pump was rendered useless, and so much salt water entered the tanks that the fresh water was made brackish, though not unfit for use. The report states that the men are all well and have plenty of canned goods to last another week. Ordinary lanterns are hung in the tower, and will be used until the damage can be repaired.

The Advantages of City Cleanliness.

There is perhaps no other city upon our Atlantic and Gulf coast where the immediate effect of cleanliness in stopping yellow fever has been better illustrated than in New Orleans. Built upon a plane below the high water mark on the banks of the Mississippi River, the soil is necessarily saturated, and no attention having been given to sanitary measures, it soon became one of the filthiest and sickliest cities in the land. In consequence it has been visited by yellow fever 36 times in the last seventy-seven years, with a loss of life fully one-third of that sustained by the United States during the same period. Here quarantine was tried and given up in disgust, and again tried, all to no purpose. Every effort to save the city from the pestilence failed. During the early part of the civil war, and while in the hands of the enemy, it was cleaned as thoroughly as possible under military rule; and while other cities on the coast had the yellow fever, New Orleans escaped, notwithstanding the fact that cases originated in the river opposite the city on board ship. The disease did not reappear until 1867—the city having again been permitted to relapse into its former filthy condition, and the yellow fever to its former habits. Immediately after the terrible epidemic of 1878 a citizens' sanitary association was organized which furnished the money to remove the accumulated filth. The scavenger system was remodeled, steam pumps were used to empty the drains into the lake. Burials within the city were forbidden, and to this day the Southern metropolis has had no yellow fever epidemic, although sporadic cases have occurred on several occasions since.

Now, if New Orleans, in her unhealthy situation and with so many difficulties in the way to secure either subsoil drainage or an efficient system of house drainage, has been able to prevent yellow fever epidemics by the systematic removal of filth and surface water, there is certainly no valid reason why any city in the southern latitudes should be allowed to remain in the condition necessary to create or to propagate yellow fever.

If the money spent by the State governments and municipalities for quarantine purposes had been used for permanent sanitary works; if the general government had used the money spent for quarantine service and for epidemic purposes in the thorough drainage of sea ports, yellow fever as an epidemic would have disappeared long ago from Southern cities as it has done at the North and the world over, wherever a sufficient amount of money has been spent for sanitary work. If Congress, instead of giving quarantine officers power to squander money by the million, and trample upon the personal liberties of American citizens, would employ skilled engineers and sanitarians instead, and spend those millions in improving the sanitary condition of filthy ports, our commerce need never again be impeded by the detention of ships at quarantine. As soon as international laws are made and properly enforced which will secure cleanliness and free ventilation aboard ship, and that hospitals for the treatment of the sick and the detention of the infected will be provided, neither the plague, cholera, typhus, yellow fever, nor even small pox need ever be feared in this country.—J. C. Le Hardy, M.D.

The Tongues of Birds.

Every naturalist, says Nature, is acquainted with the elaborate spring-like mechanism by which the woodpeckers and humming birds are enabled to protrude their tongues with such rapidity for the capture of insect prey. These remarkable instances of adaptation have been more than once described, and some other special modifications of the avian tongue and its bony supports will be recalled by ornithologists. In a recent number of Der Zoologische Garten, Herr Schenkling-Prevot redescribes these cases after a renewed investigation, and also supplies a quantity of interesting information on the form of the tongue and hyoid apparatus of birds in general. The old idea that the woodpecker transfixes its prey with its sharped-tipped tongue is probably not yet extinct, but Herr Prevot adds his opposition to this opinion, and states that the insects are agglutinated to its tongue by the sticky secretion with which its surface is copiously covered.

Although the form of the tongue usually corresponds to the shape of the bill, there are exceptions to this rule, as, for example, in the waders, kingfisher, and hoopoe, which, in spite of their long bills, only possess small cartilaginous tongues; in the pelican, indeed, the tongue is altogether rudimentary. In most birds, whose food consists of seeds, the tongue is dart or awl shaped; in others, spatulate; rarely, vermiform or tubular. In some birds, such as the owl, which swallow their prey entire, the tongue is broad and serves as a mere shovel. In the hedge sparrow, nuthatch, woodcock, and others the tongue is bifid or trifid at its apex, while in the hummingbirds the tongue is split into two branches almost to its base, and is used for actually gripping the small insects on which these resplendent little creatures subsist. In a family of parrots (Trichoglossidæ) the tongue is provided at its apex with a brush of some 250 to 300 hair-like processes. In the parrots, the tongue is thick and fleshy, devoid of horny barbs or papillæ, and is even suspected to possess sense organs of taste. Herr Prevot concludes his concise but interesting paper with some remarks on the influence of the form of tongue in birds on their varying powers of articulation. It is interesting to note that the parrots, the form of whose tongues most closely resembles that of man, are able to imitate his language more clearly than any other birds.

American Well Boring Machinery in Russia.

Under date of November 9, Consul Bornholt, of Riga, in his annual report, refers as follows to American well boring machinery:

Several private artesian wells have been placed at the disposal of the inhabitants, but these not being sufficient to meet the demands, the municipal council has under contemplation the sinking of twenty or thirty artesian wells in different parts of the city. As the United States are ahead of all other nations in deep well boring, I have interested myself for the introduction of American machinery for this purpose, and trials are now being made with steam drilling machines from New York, imported by a party in Riga. If these trials are successful, well digging will be carried out on a large scale in this country on the American system.

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Improvements in New York Harbor During 1894.

During the past year an extensive series of improvements have been carried out in New York Harbor. Work has been in progress at nineteen different points. The work consisted in dredging out the shallow channels, in removing masses of rock or land which has stood in the way of vessels, wrecks have been removed, new sea walls and embankments have been built, measures have been taken to provide a more perfect defense, and a general modification and improvement of harbor lines is under way. Since New York has the most important harbor in the country, no trouble or expense has been spared in these improvements. During the year the government has expended about $1,000,000.

One of the most important improvements consists in dredging away and deepening the channel between Governor's Island and Brooklyn, which is known as Buttermilk Channel. The channel was made dangerous by the presence of three shoals which have long been a menace to navigation. These have been dredged away to a depth of 26 feet mean low water and with a width of 440 feet. Some 345,090 cubic yards of earth have been removed. Work has also been in progress on the channel between Staten Island and New Jersey. Previous to the improvements in this quarter the channel had a depth of but 9 feet, and this has been enlarged to a channel 400 feet wide and 13 feet deep. Work is so nearly complete as to permit vessels to pass through the channel, and the amount of commerce reported for the past year is 3,483,911 tons.

The channel of Gowanus Creek and Bay, near the southwestern part of the city of Brooklyn, has also been considerably widened and deepened. The original channel was only from 7 to 12 feet deep at mean low water, and a depth of 18 feet for a distance of one mile is to be provided. During the year 1894, $56,298 have been expended and some 342,270 cubic yards of earth have been removed at this point.

Extensive improvements have also been made in the Harlem River and Spuyten Duyvil Creek; originally there was no navigation between these two streams. The object of the improvements has been to provide a navigable channel between the East and Hudson Rivers. The original plans were estimated to cost $2,700,000. During 1894 a channel has been dredged in the Harlem River 9 feet deep mean low water and about 160 feet wide to within 200 feet of the east dam. In the Spuyten Duyvil Creek a channel of 9 feet deep, mean low water, and 150 feet wide has been dredged from the Hudson River to within 140 feet of the west dam. About $108,539 has been expended on the work during the year. Work has been also in progress to deepen and widen the channel of Sumpawanus Inlet. This channel is being dredged to provide a waterway 5 feet deep at mean low water with a width of from 100 to 150 feet, and for a distance of 4,500 feet. The commerce of this inlet for the past year has been 1,350 tons.

Important improvements have, furthermore, been made during the year in the main entrance to the harbor. The original depth in midchannel was 23·7. This was the least depth, and a great proportion of the commerce of New York could only cross the shoals at high water. The plan for improving this channel provides for dredging a channel 1,000 feet wide and 30 feet deep at mean low water. The estimated cost of the work was $1,490,000 for dredging 4,300,000 cubic yards of earth, and it was expected that the entire cost of improvement would be between $5,000,000 and $6,000,000. So far about $2,000,000 have been expended. The amount expended during 1894 was $70,964, and some 348,963 cubic yards of material were removed.

Treatment for Sprained Ankles.

In these days of bicycling, skating, tobogganning, and other out-of-door amusements incident to the seasons, accidents of various kinds are daily occurring, not usually serious, but often painful when seemingly slight.

From time to time one hears of different means of caring for sprained ankles, turned ankles, twisted wrists, etc., but the way now in vogue seems to give better results than any in the past.

It is generally within an hour after the accident that you are called in to see the case. The patient is suffering very severely, and wanting very much to know if "anything is broken." After examining for fractures, the Southern Medical Journal recommends the part to be bathed in extremely hot water, every hour or two, for a period of fifteen minutes at a time. Have the water just as hot as the patient can bear it, and apply with a sponge or cloth, rather than allow the ankle to lie in the water. Then dry and let the part rest quietly, wrapped in flannels, when an application of hamamelis, or veratrum and hamamelis, may be made.

Before retiring, apply a flannel bandage tightly around the swollen part, only being careful that the circulation is not shut off.

It is surprising how the hot applications relieve the pain and produce absorption, and how the bandage, by pressure, prevents swelling and inflammation.

Correspondence.

STORAGE BATTERIES CHARGED BY GRAVITY BATTERIES.

To the Editor of the SCIENTIFIC AMERICAN:

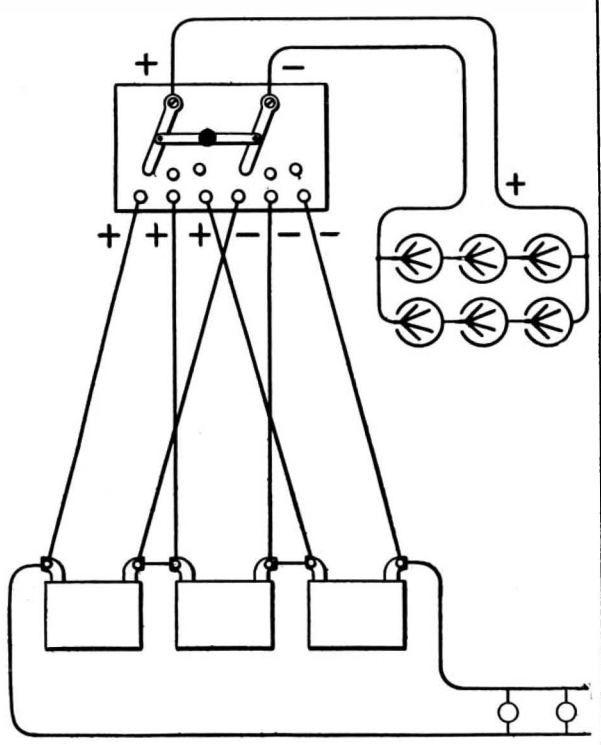
I see in your Notes and Queries that you have a good many inquiries about storage batteries being charged by gravity batteries. I inclose a copy of my plant that I am using. It has given the best of satisfaction up to the present time.

I offer it for publication, as it might help some person using a storage battery.

I have three storage batteries composed of five plates each (plates 6 by 8½ inches, perforated, and filled with red lead for the positive and litharge for the negative). I use six Crowfoot batteries for charging.

The Crowfoot batteries are connected three in series and two in multiple arc. The storage batteries are connected in series, and each battery is connected on a binding screw of a three-point pole-changing switch, with the Crowfoot battery. The switch is moved one point every twelve hours, so that each battery gets its supply of current. These batteries have been in use for a year and a half, and I have not had any trouble with them (excepting when the Crowfoot batteries had to be renewed).

I am at present using two lamps of two candle power, and the longest time that I have used them at



one time was three hours. By looking at the diagram above I think my explanation will be better understood.

E. C. DREWS.

The Dalles, Ore.

Disastrous Effects of the Hot Winds.

To the Editor of the SCIENTIFIC AMERICAN:

It is quite generally known that a part of Texas, the Indian Territory, Western Kansas and Nebraska and part of Colorado suffers greatly from what is known as the "hot winds," a south or southwesterly wind that, owing to its high temperature and arid state, withers and, as the inhabitants of those regions say, "burns up" everything that grows above the ground. Its blasting effects are so terrible sometimes that every green thing, especially cultivated crops, is completely killed in a few hours, though the wind continues sometimes to blow for several days. Its destructive effects are not always however in proportion to the length of time it continues.

The suggestion I wish to make is this: A series or chain of lakes or very large reservoirs could be constructed in Texas or New Mexico, or further north in the Indian Territory and Colorado, which would reduce the temperature and at the same time render more humid the said destructive winds, and also increase the rainfall to the north, northeast, east and southeast from those lakes. Those advantages would not be the only ones that would result from such great reservoirs, but the country in the vicinity of the lakes, and as far therefrom as it would be practicable to make irrigating canals, could be greatly benefited by such a system. Besides the advantage that should be hoped for by way of rendering the "hot winds" harmless and increasing the rainfall, the district that should be irrigated would have its productive capacity doubled or trebled.

The rainfall over this vast plain over which the "hot winds" blow is not sufficient; in fact, the year is the exception when the rainfall is sufficient.

If such a plan as here suggested were put into practice, the benefit in the way of evaporation would not be dependent on the water surface alone, but from the irrigated land also. Hence the area thus contributing moisture to the arid winds would be large.

Is it not a matter that Congress should give some attention to? It seems that the officials who have the directing of internal improvements should see to it that a man be appointed to make the preliminary explorations and surveys, also estimates of the probable cost of dams and the general feasibility of such improvements, and the surface water supply, and also subterranean water supply.

If Congress were to make the necessary appropriation, the preliminary work as above outlined could be readily made.

There seems to be no law obstructing the way to such a course, for the government has a civil engineer in Colorado and two or three other States whose duties are principally confined to irrigating matters. It seems from this that no law stands in the way of such work being conducted in the States here named, as well as any other State.

BENJAMIN HILL.

Tiona, Pa., January 21, 1895.

Protecting Telephone Wires from Danger Due to Contact with Trolley Wires.

In the SCIENTIFIC AMERICAN of January 5, under "Notes and Queries," L. A. F. asks: "How can the danger resulting from the falling of a private telephone wire onto a trolley wire be avoided?"

You answer by guard wires placed over the trolley wires. In our city there are no guard wires, and as a result the fire alarm, police signals, and telephone instruments are burned out during sleet and ice storms. My experience has been, on a grounded line to place a fusible cut-out in the line at each end of the circuit before the wire connects with the instrument. A simple cut-out may be made and cost but a dime by connecting a strip of tinfoil 4 inches long, ⅛ wide, having the ends held in place by a brass spring at each end, and under this place a piece of asbestos 8 inches by 1½, to prevent the wood from taking fire, if a cross occurs.

For short lines use metallic circuit. It is much safer than to ground the instrument.

A. C. B.

Meriden, Conn.

[The trolley wires should be provided with guard wires or something should be done to protect person and property from the danger incident to contact of telephone and telegraph circuits.—ED.]

Telegraphy in Texas.

The Texas rule allowing senders of telegraph messages to recover for damages to their feelings from delay in transmitting the dispatches leads to an enormous amount of litigation against the telegraph companies. In some of the digests almost the whole section referring to actions against telegraph companies consists of references to the decisions of the Texas courts. Many of the messages relate to the sickness or death of relatives. In one of the latest cases it was shown that the message could not have been delivered in time to enable the woman to whom it was addressed to be present at the funeral of her father, whose sickness was reported in the telegram. She endeavored, nevertheless, to obtain damages, on the ground that if she had received the message promptly, she might have telegraphed asking that the funeral be postponed, and so might have been present at the services. The supreme court reversed the judgment for $500, obtained against the company. A verdict of $2,000, obtained by a father who had not received promptly a message concerning his sick son, one of $500 for delay in delivering a telegram announcing the funeral of a brother, and one of $1,000 for failure to deliver promptly a message telling of the sickness of a half sister were not set aside as excessive. In one case it was shown that there was no great affection between the person to whom the telegram was addressed and the sick relative, but the verdict was allowed to stand. In some cases the amount of mental anguish could not have been great, but the Texas juries, with great regularity and promptness, find verdicts against the telegraph companies when such cases are brought before them.

A Loose Set Screw.

On Thursday, January 10, the fly wheel of the Atlas engine at the factory of Page Bros. & Co., 233 Cambridge Street, Boston, exploded with a terrific crash, smashing the wheel into hundreds of pieces and tearing up floors and partitions about it. One man was quite seriously injured by the flying masses of iron, and was taken to the hospital. The other employes were badly frightened and some narrow escapes are reported. The engineer was sitting in the boiler room near the engine when he noticed the speed was increasing. His first thought was the engine, but before he could get to the throttle the exhaust pipe had broken, and he immediately shut off the steam at the boiler, but before this could be done the wheel had exploded, the time from the first acceleration of speed to the final burst being scarcely a minute.

The engine was a balanced slide valve with shaft governor, and the bursted wheel was 8 feet in diameter, 15 inch face, and the rim averaged ½ inch in thickness. The shaft governor is of the type common to these engines. A loose set screw was the immediate cause of the disaster.

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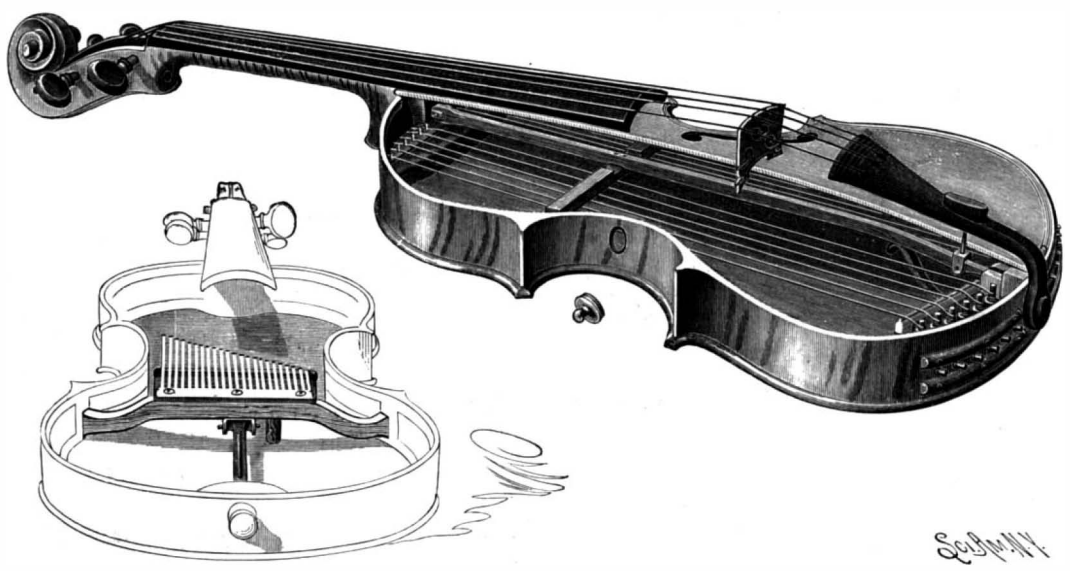
A NEW VIOLIN.

The accompanying illustration represents an improvement in violins, violas, violoncellos, and similar stringed instruments, and recently patented in the United States and the leading foreign countries by Professor Bruno E. Wollenhaupt, of No. 1837 Madison Avenue, New York City.

The appearance of the instrument is the same as that of the ordinary violin, but within its body is arranged an auxiliary vibrating device sounding sympathetically and in unison with the outside strings when the latter are played on by the bow. Only those parts of the auxiliary vibrating device are sounded as are tuned in harmony with the corresponding main strings when the latter are played on. The auxiliary vibrating device consists of twelve metallic strings representing an octave of twelve half tones tuned from C–B, or from G–F sharp, and these strings are stretched longitudinally within the body and can be tuned to the required pitch from the bout by a key, the strings being sounded by means of a short thin stick passed either through the F holes or through openings in the sides of the body; the openings being, however, normally closed by small plugs, as shown in the illustration. A very important feature of the invention is the dampening device, completely under the control of the player, and consisting of a transverse brush or dampening bar supported on a lever pivoted in the body and carrying on its rear end an upwardly extending rod passing through apertures in the top of the body and tailpiece to be engaged at its upper end by a small block held on a flat spring. This block can be pressed by the player's chin to cause a swinging of the lever, so that the brush or dampening bar is moved in contact with all the strings of the auxiliary vibrating device, thus stopping the sounds emanating from the latter. When the player lifts the chin, then the brush falls back to its normal position, that is, out of contact with the vibrating device, and the latter again sounds sympathetically as soon as the outside strings are played on by the bow. Instead of using strings for the auxiliary vibrating device, a metallic comb may be employed, as shown in the smaller figure.

When the instrument is played every tone, from the highest pitch to the lowest pitch, will cause the corresponding auxiliary string, or prong of the comb, to vibrate sympathetically, and, therefore, cause a prolongation and increase in volume of the tone played. All harmonics, natural or artificial, respond and prolong the sound produced by the bow passing over the main strings, but in succeeding chords it is advisable to apply the damper to prevent disharmony.

The first violins were built according to Professor Wollenhaupt's invention by the celebrated violin builder, Mr. Geo. Genmender, Sr., of Astoria, N. Y. During a trip to Europe last summer Professor Wollenhaupt played on his new violin before the king of violinists, Professor Joachim, in Berlin, and this authority speaks in the highest terms of the improvement. A like testimonial is given by Professor J. Von Bermuth, in Hamburg, and Dr. Koenig, in Paris, the well known authority on acoustics, considers the invention a perfect success.



THE WOLLENHAUPT VIOLIN.

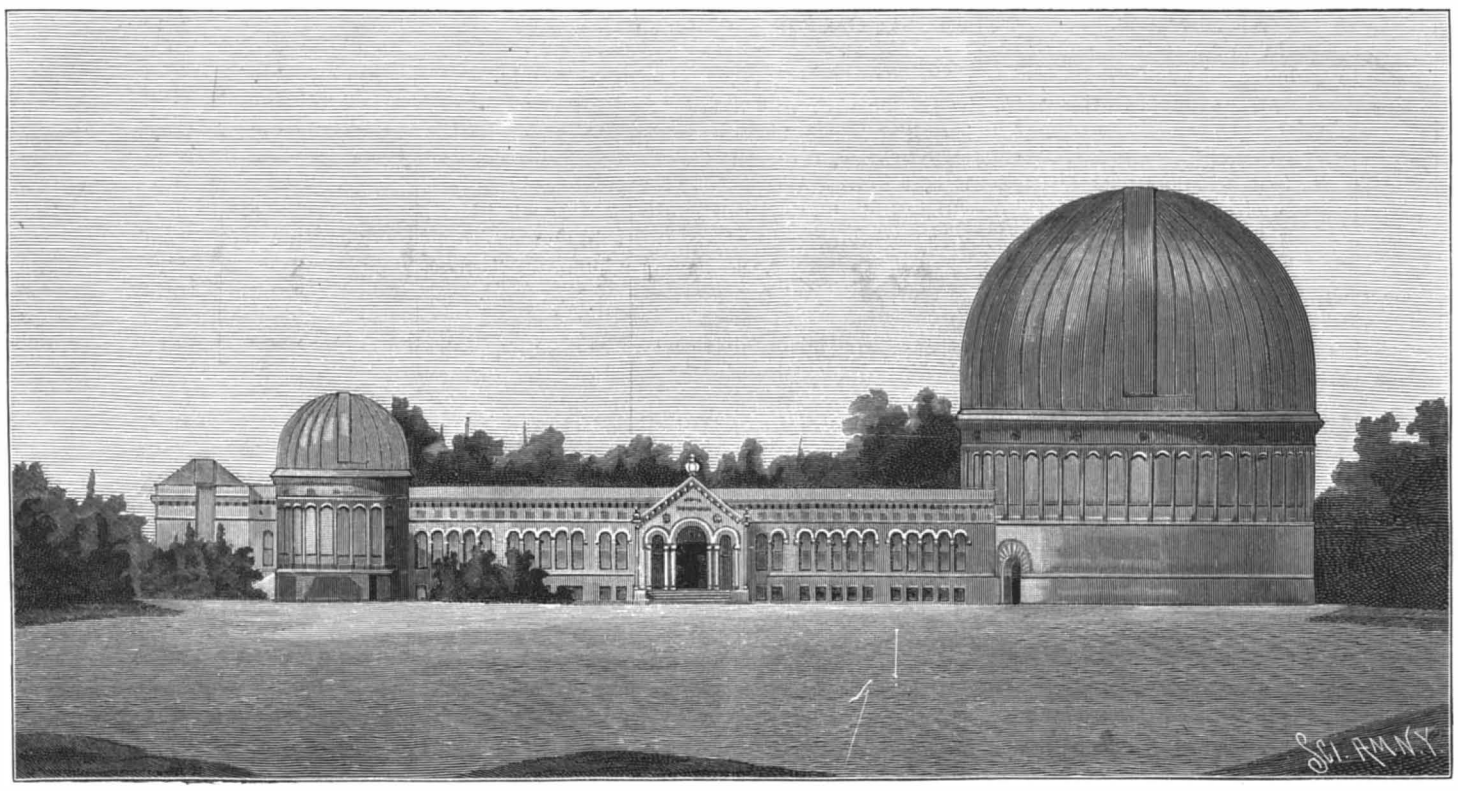
FROM June, 1791, to November, 1813, the French government enrolled 4,556,000 men, nearly three-fourths of whom died in battle, of wounds or of diseases contracted in the field.

THE YERKES OBSERVATORY—UNIVERSITY OF CHICAGO.

The first University of Chicago closed its work in 1886. Within a few months thereafter Mr. John D. Rockefeller took into consideration the founding of a new institution of learning in that city. Mr. Rockefeller contributed over $4,000,000 to the new university, and he was followed by Martin A. Ryerson, Sydney A. Kent, Marshall Field, Silas B. Cobb, W. B. Ogden and others. The total gifts to the university since its foundation in 1889 have been between seven and eight millions of dollars, or more than the entire endowment and property of some of our Eastern colleges of long standing. The university occupies a large tract of ground between 57th and 59th Streets, Ellis and Lexington Avenues, and is near the South Park station of the Illinois Central Railroad. Some of the university buildings front on the Midway Plaisance, which is so familiar to the thousands of visitors to the Columbian exposition in 1893. On the grounds of the university about forty buildings have been erected, in which the work of the university is carried on. Under the presidency of William R. Harper, Ph.D., D.D., a corps of professors and instructors of high standing were engaged and a large number of students were enrolled. The success of the university has been most gratifying, and a glance at the "Annual Register," which is a model book of the kind, will give an insight into the various courses.

Scientific work of great importance is already carried on at the university, and when the new Yerkes Observatory, situated at Geneva Lake, Wisconsin, shall be completed, unrivaled facilities will be offered for graduate instruction and original research in astronomy and astro-physics. In our issue of the SCIENTIFIC AMERICAN for January 28, 1893, we gave an account of Mr. Charles T. Yerkes and his gift of the $500,000 telescope to the University of Chicago. We illustrate herewith the new Yerkes Observatory, which is now being erected at Geneva Lake, after the plans of Henry Ives Cobb, the well known architect of the Fisheries building at the Chicago exposition. The large dome, which has a diameter of about eighty-five feet, will house the great 40 inch telescope. The observing slit will be about fifteen feet wide and extends from the horizon beyond the zenith. The large disks of optical glass were made by Mantois. The clear aperture of the objective is 40 inches, thus making the instrument the largest and most powerful refracting telescope ever constructed. The objective is being made by Alvan Clark & Sons, and Warner & Swasey have already completed the mounting. The mounting is similar to that of the 36 inch Lick telescope, but it is much heavier and more rigid, and many improvements have been introduced. An important feature, employed in this telescope for the first time, is a system of electric motors, by which the various motions, etc., are operated. It will be possible for an astronomer, at the eyepiece end of the telescope, or in any part of the observing room, by simply touching buttons in a small keyboard, to (1) clamp in declination; (2) give slow motion in declination; (3) give quick motion in declination; (4) clamp in right ascension; (5) give slow motion in right ascension; (6) give quick motion in right ascension; (7) stop or start the clock; (8) open or close the shutter of dome; (9) cause the dome to revolve; (10) cause the floor to rise or fall. The declination circle can also be read at the eye end, and all of the above motions operated, and both circles read by an assistant on the balcony which surrounds the top of the iron pier. The driving clock is wound automatically by an electric motor. The elevating floor of the observing room, about seventy feet in diameter, will be movable through a range of about twenty-five feet by means of hydraulic rams.

The spectroscopic attachments of the 40 inch telescope will be three in number: 1. A spectro-heliograph, for photographing the solar chromosphere, prominences and faculae by monochromatic light. 2. A stellar spectroscope, for photographic and visual investigation of stellar spectra, and determination of motion, in the line of sight. 3. A solar spectroscope, for photographic and visual study of solar phenomena. Graduate students in astronomy and astro-physics will be given an opportunity for study and investigation in the observatory under the guidance of the astronomers. Undergraduate instruction in astronomy will be given in the University in Chicago. Until the completion of the observatory, students will do work as heretofore in connection with the Kenwood Observatory.



THE YERKES OBSERVATORY, UNIVERSITY OF CHICAGO—HENRY IVES COBB, ARCHITECT.

Archæological Discovery in Jerusalem.

Dr. Bliss and Herr von Schick, of the Palestine Exploration Fund, write that the iron-bound door of Neby Daud, which had remained open against the wall for a number of years, having been recently blown down during a severe storm, there was discovered on one of the stones behind it an inscription which seems not to have been before noticed. It is in Latin, and is a votive tablet to Jupiter on behalf of the welfare and greatness of the Emperor Trajan and the Roman people, erected by the Third Legion, which takes us back to the interval between the destruction by Titus and the founding of Ælia Capitolina. It was partly concealed with plaster, and may have been entirely covered when the door was last opened and shut, which may account for its having been unnoticed. It is built into the modern wall about fifteen feet above the ground. Roman inscriptions are very rare in Jerusalem, and this discovery is therefore of exceptional interest.

THE first British steamboat, a tug, was built in 1802.

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A PAGODA INCLOSED BY A BANYAN TREE.

We are indebted to Mr. Wm. Whitley, of Myanaung, India, for a photograph, cut of which we here reproduce, showing the curious manner in which a banyan tree has grown up around and completely inclosed and embraced a pagoda. The building is of masonry, which must have been very strong to enable it to withstand the strains put on it during storms, which our correspondent states are sometimes very heavy. The photograph was taken by Mr. Francis, of the above place.

Cold Phosphorescence.

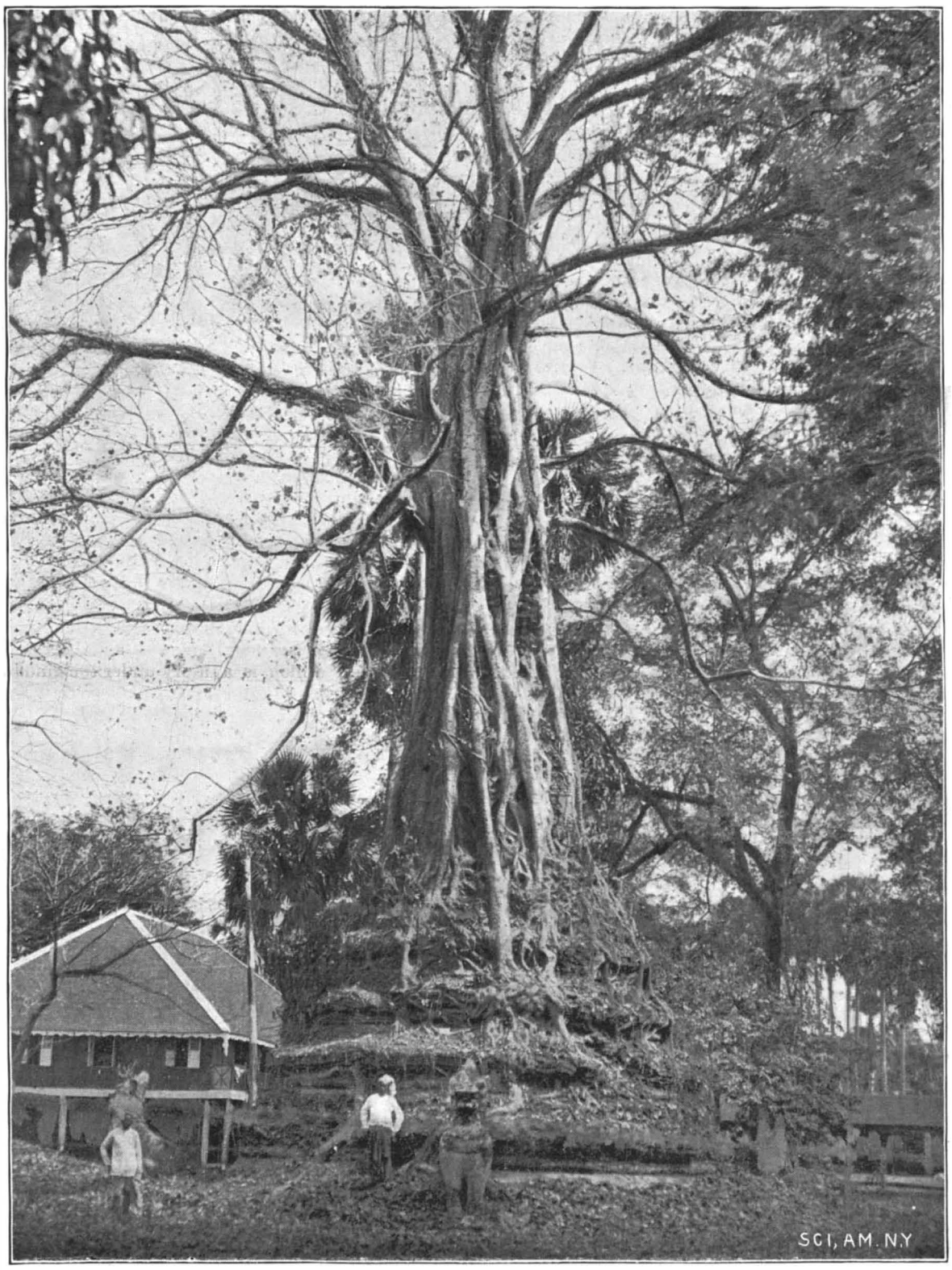
An interesting lecture on phosphorescence was lately delivered by Professor Dewar at the Royal Institution, which he delivered before the Chemical Society early in the year, and to some extent repeated the brilliant experiments in phosphorescence—the phrase is applicable whether used in the material or philosophic sense—with which that lecture was accompanied. There was this difference, however, in the constitution of the address, that whereas the lecture delivered before the Chemical Society had for its end a chemical classification of bodies according to the degree of phosphorescence they exhibited at minus temperatures, the demonstration recently rather aimed at giving something of the general history of our knowledge of phosphorescence. Professor Dewar began with definitions. We may imitate him—at some distance—perhaps ourselves. If we take a piece of phosphorus which has been exposed to the light, into a dark room, we find it giving out light; if we treat in like manner a piece of paraffin wax, we find the phenomenon repeated, though in a much slighter degree. The researches of Becquerel showed that this power of giving out absorbed light, this phosphorescence, depended directly on the intensity of the stimulating light, and also on—to be intelligible, if deeply unscientific—an action among the body's molecules, when stimulated by heat or cold. For instance, there are certain sulphides of calcium whose power of phosphorescence increases as they are heated. The action of cooling to the enormous minus temperatures which Professor Dewar obtains with liquid air and liquid oxygen is similar. As a general rule, it may be stated that the great majority of substances exhibiting feeble phosphorescence at ordinary temperature become highly phosphorescent at these very low temperatures. The paraffin wax candle glows like an electric vacuum tube after it has been dipped in boiling liquid air. And what this act of cooking appears to effect is this—it so agitates the molecules of the body that the reflected rays of absorbed light, nearly invisible under ordinary conditions, become patently visible under the action of this stimulation.

What are known as the ultra-violet rays of the spectrum become visible, for there is this characteristic of phosphorescence to be noted, that in all cases the luminous effects belong to a less refrangible part of the spectrum than the exciting rays.

Gelatine, celluloid, paraffin, ivory, horn and India rubber become distinctly luminous, with a bluish or greenish phosphorescence, after cooling to —180°, and being stimulated by the electric light. An egg dipped into a beam of electric light and then, having cooled it to —180°, shows the spectators that it glows like Protean fire.

It was very interesting to see that, although when water is pure it is only feebly phosphorescent, yet that it is remarkably luminous when impure. Feathers dipped in the boiling liquid air shone clearly outlined in the darkened room with a delicate green light, and lastly the professor took a stephanotis and cooled it to the temperature at which every living thing must die. But the flower, as if protected by a fairy godmother, only steeled itself to the ordeal, becoming, indeed, as brittle as the finest glass, and when it was lifted from out the liquid, glowed magically with a pale blue light.

The concluding part of the lecture dealt with the effect of the minus temperatures on photographic films. At —180° phosphorus will not burn; chemical action ceases. Therefore, when Professor Dewar first applied his temperatures to photographic action, he had, he said, been puzzled to find that the action, though considerably diminished, still went on. The impression on a chilled photographic film was less by about 80 per cent than that left on a film at ordinary temperatures, but still there the impression was. How was it? "I stumbled on it," said Professor Dewar. "It was phosphorescence. I was actually stimulating the plate by cooling it." The fact is that, like so many other bodies, a photographic film, when cooled to —180°, becomes more capable of absorbing and reproducing light impressed upon it, and acts, so to speak, by its own phosphorescence.



A PAGODA INCLOSED BY A BANYAN TREE.

A Novel Application of Bichromated Gelatin.

Izarn, the author, recommends coating silvered surfaces in general, and the mirrors of astronomical telescopes in particular, with an extremely thin film of bichromated gelatin in order to protect them from atmospheric tarnish. Such films are stated to be very adhesive, durable and transparent; and it was found by experiment that surfaces thus protected remained perfectly bright, even after prolonged contact with sulphureted hydrogen. The process has been applied to the mirror of a telescope at the Toulouse observatory with very satisfactory results, the sharpness of definition, etc., of the instrument being in no way deteriorated.

The Sutro Baths.

The Sutro baths exceed the famous Roman baths of antiquity, in size as well as equipment. The largest of the Roman baths had about two hundred feet of frontage, to use the modern commercial terms of designation. Two of these great bathing places might be dropped within the Sutro baths and still leave room enough for men to walk and women to flirt. Adolph Sutro is a skillful engineer, and he enjoys solving problems in construction or breaking through difficulties in mechanics as he enjoys invigorating exercise. He designed the building over the bath, devised the plan for water supply, invented and patented the apparatus for heating the water.

The Sutro tunnels, second series, are part of his scheme of construction. With the ocean at his feet, the breakers dashing against the rocks, Mr. Sutro deemed that nature had so well provided power to send the water to the bathing tanks that artificial means would be unnecessary. Therefore, with much noise and enthusiasm, he blasted out a basin in the solid rock. Over the edge of this basin comes the water of the huge rollers. Instead of riding the crest of the wave, Mr. Sutro traps the crest of the wave and uses it for his own purpose. From the basin the water flows through tunnels and canals, passes gates until it reaches the reservoir, where it is warmed by the Sutro patent process, and then it flows into the great tanks in the huge glass and steel building. On the road to the tanks through the canals and the tunnels the water has to pay toll of sand. Of course it would not do to have the waves carry their load of sand into the baths, so a settling place is provided. By automatic arrangement, also the device of Mr. Sutro, the sand is washed back into the ocean, while the water, cleared, goes on its course through the tunnels and canals to the tanks.

Sometimes the tide is very low, and sometimes the ocean, even at the cliff, is quiet. There might be times when the water could not dash over the rocky wall into the basin. Artifice is employed to take the place of nature when nature is in a quiet mood. An emergency pipe pokes its black proboscis under the waves, and a pump can draw through it 5,000 gallons a minute, whenever the 5,000 gallons are wanted in a minute. Having made enough tunnels to admit the water, sandless and tepid, to the tanks, Mr. Sutro had to provide for sending the water to sea again, that the ocean might not be drained. Dropping out the water at the place at which it was taken in would not be satisfactory. Mr. Sutro did not want the baths to be receiving the same water over and over again. That plan would be too easy. In it were no obstacles to overcome. He laid an outlet pipe through tunnels probably several hundred feet long, and through this the water will flow from the tanks and return to the sea several hundred feet from the place whence it was taken. The water that comes in through the tunnels must fill six tanks. The largest of these, the main swimming tank, is 275 feet long, and at the place of greatest breadth is 150 feet wide. The other tanks are smaller. Some will be used for ladies and children, some for beginners; each one has its particular use. One tank will be filled with cold salt water for swimmers who want a shock. Then there is a little tank filled with fresh water, supplied from the Sutro water works on the bluff above.—San Francisco Examiner.

THE velocity of light may be taken as about 186,300 miles a second.

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Ship Canals Projected and in Progress.

The Suez Canal cost $115,000,000 and is capitalized at $90,500,000. In 1892 it paid a net profit of $8,333,333⅓, which was produced by the passage of 3,559 vessels through the canal. Shares, the par value of which is $100, are quoted on the Paris Bourse at $538.50. The $20,000,000 worth of stock held by the British government is quoted at $95,000,000 in the open market.

The Nicaragua Canal, even if a commercial failure, would be of great advantage to the United States, as the controlling ownership of this waterway between the oceans would be worth the $70,000,000 to which government credit is expressly limited in the bill now pending before Congress. The fate of the Panama Canal is still in doubt. In the United States several canal projects are under discussion. The plans for a ship canal between Delaware and Chesapeake Bays, and from the Hudson to the Great Lakes, have already been noticed in the SCIENTIFIC AMERICAN for July 21 and September 29, 1894. Two additional schemes are now under discussion. First, the ship canal between the Delaware River and Raritan Bay, an important link in the chain of interior waterways, which will ultimately, it is hoped, enable vessels of large size to pass from Boston to the Gulf of Mexico without being exposed to the fire of a hostile fleet. The second ship canal, known as the Florida Ship Canal, which is intended to pierce the isthmus that connects the peninsula with the mainland, is being warmly advocated by the Southern press. This canal would only be one hundred and fifty miles long and would lessen the distance between New Orleans and Liverpool by 1,000 miles and would tend to greatly increase the commerce of the Southern ports. It would be of great value in the development of the Southern and Western coal fields.

Europe has had three ship canals opened for traffic in the last eighteen months, the Manchester, the Corinth and the Baltic and North Sea Canals, and several others are now under discussion. The most important of these canals are the Manchester and the Baltic and North Sea Canals. We illustrated the locks of the latter canal in the SCIENTIFIC AMERICAN of December 1, 1894. It is 61 miles long, 200 feet wide at the surface, 85 feet at the bottom and the depth is 28 feet. The canal will be crossed by four railway lines and six highroads. The canal starts at Holtenau, on Kiel Bay, and joins the Elbe 15 miles above its mouth. The estimated cost is $39,000,000. The Elbe-Trave Canal will probably be built for use in connection with the Baltic and North Sea Canal; the estimated cost is $5,340,000. Prussia has contributed $1,875,000 toward it. As nearly seven-eighths of the proposed canal is in Prussian territory, the community is naturally interested in preventing Hamburg from monopolizing the trade of the country.

A scheme is now under discussion to enlarge the canal and port of Brussels, so as to make it accessible to vessels of 2,000 tons. The government has promised 10,000,000 francs and the city 7,000,000 francs. The estimated cost of the canal is only about $3,700,000. The Merwede Canal, between Amsterdam and the Rhine, can hardly rank as a ship canal, as the depth is only 10¼ feet. One portion of it was completed August 4, 1892.

For a number of years past the subject of the canalization of the Seine has been agitated in France. Rouen is a port for sea-going vessels, but there seems to be great opposition toward any attempt to make Paris one also. The plan of M. Bouquet de la Grye for securing a draught of 24·4 feet from Havre to Paris is now under discussion. By the improvements which have already been made in the river it has been possible for a gunboat to reach Paris, and a short time ago a three-masted sea-going bark, 203 feet long, was launched at St. Denis, just below Paris. The depth of the hold of this vessel was 22 feet and the beam was 35 feet.

A decree published in the Journal Officiel for September 22, 1894, provided for a commission of inquiry to look into the plans, which had been placed on exhibition at Paris in June, for the Bay of Biscay and Mediterranean Ship Canal. The length of the canal, which will extend from Bordeaux to Narbonne, varies in the different plans from 220 to 320 miles, the cost of which would be from $200,000,000 to $300,000,000. Such a canal would be of great service both in times of peace and war, but the expense is a serious drawback to the success of the enterprise, as the amount received for tolls would probably not be sufficient to pay the interest on the debt. Italy has recently had two ship canal projects, neither of which is likely to materialize in the near future. They are, however, very interesting from an engineering point of view, owing to the reclamation of large tracts of land which are useless at present. The first scheme is a waterway deep enough for the largest war vessels to pass from the Mediterranean Sea to the Adriatic. The canal, which would be 125 miles long, would proceed from Montalto di Castro to the east coast at Fano. It would drain large boggy districts as well as the lakes of Thrasymene, Bolseno, and Montepulciano. The cost would be about $120,000,000. The second project is more feasible. It is to make a canal 24 miles long at Reggio, connecting with the Amato and Carace Rivers, thus piercing the peninsula and enabling vessels to pass through without sailing around Sicily or going through the straits of Messina. The promoters expect that the land which would be rendered fit for cultivation would pay the cost.

In Great Britain two canals have been discussed, and there is every prospect that one of them, the Forth and Clyde Ship Canal, will be constructed; the other, the Wakefield Ship Canal, in Yorkshire, England, is of purely local interest. The estimated cost of the Forth and Clyde Canal is from $35,000,000 to $40,000,000, depending on the route adopted. The route has not been definitely decided on as yet. Three thousand vessels used the Manchester Ship Canal in the first year after its opening.

DECISIONS RELATING TO PATENTS.

U. S. Circuit Court—Southern District of New York.

TRAVERS *v.* AMERICAN CORDAGE COMPANY.

Patents No. 277,161, issued May 8, 1883, and No. 296,460, issued April 8, 1884, to Albert O. Rood, for improvements in the art of making hammocks, examined and held to be valid.

Coxe, J.

The earlier patent, No. 277,161, relates to a new process of making the bodies of hammocks. Prior to the invention this had been done by weaving the thread in both directions between the supporting frames. The operator, provided with a shuttle on which the thread was wound, began at one end of the selvedge and interlooped the thread with the thread attached to the selvedge until she reached the opposite end of the frame, when she repeated the same interlacing process back again, and so on from one end of the frame to the other until the hammock body was completed. This operation took considerable time. It is estimated that an hour and twenty minutes was consumed in weaving one hammock body. The inventor reduced the operator's manipulation about fifty per cent by laying a strand straight across from frame to frame and weaving that strand into the hammock body. Instead of weaving each time she crosses from frame to frame, as in the old method, the operator now weaves every other time only. The work of the shuttle is thus reduced from two trips to one. That this saves time is manifest. Precisely how much time is saved is not established. The test made by the complainant's expert is not a demonstration. If he be right in his estimates, the invention increases the production threefold.

Rood, being the first in this particular branch of industry, is entitled to a liberal construction—a construction which will enable him to hold the fruits of his invention. So to construe the claim that an infringer is able to take the only valuable feature of the invention is to do injustice to the inventor.

It appears that almost from its inception the inventor was endeavoring to improve his process: that improvements were made in 1884, and again in 1889, when the improved method was adopted which is now practiced by both complainant and defendant. It is not necessary to describe this method. The changes do not go to the essence of the invention. It is a more convenient way of practicing it and produces a hammock body having a more symmetrical appearance; but the essence of the invention is in this method precisely as in the method described in the patent. The defendant, having appropriated this method, is not exculpated because it has used it in connection with improvements subsequently adopted by the inventor.

Patent No. 296,460 relates to a new method of making the ends of hammocks—attaching the converging stands to the completed hammock body. Previous to the invention this had been done by winding the end cord around a shuttle and carrying the cord by means of the shuttle through a loop of the hammock body, thence around a pin fixed at the desired distance from the hammock body, back again through another loop, and so on back and forth through a loop and around the pin until all the loops had thus been taken up. The patentee dispenses with this tiresome and expensive process. He draws the end of a cord, which he takes from a large reel, through all the end loops of the hammock body, and from thence to a fixed pin, to which the cord is tied. He then draws the cord from between the loops and lays it over two fixed pins, and so on until the cord has been so drawn from between each of the loops, the reel permitting the cord to run easily through the loops. When all the loops have been thus connected, the cord is cut, the other end is released from the pin, the two ends are united, and the strands between the pins are wound and formed into an end loop ready for use.

There is evidence that this method is simpler and more rapid than the old one; that by it an inexperienced operator can make four or five times as many hammocks as an experienced operator can make by the old method. It saves time and money. Nothing like it was ever done before.

The defenses are lack of invention and anticipation. Infringement is not denied.

The contention that the patent is anticipated is based upon the alleged prior use of Louis Hinze.

It is unnecessary to discuss this testimony. Suffice it to say that the only proposition which it establishes beyond a reasonable doubt is that it is absolutely untrustworthy. It is so full of contradictions, inaccuracies, and tergiversations, so permeated with venality, so honeycombed with falsehood—to use no harsher term—that the court cannot for a moment think of basing any finding thereon injurious to the patent. This defense has been so often and so lately considered by this court that it is unnecessary to dwell upon the rules which require the court to disregard it now.

Does this patent disclose invention?

The process is a simple but ingenious one which would not have occurred to the skilled hammock maker, even if he had before him all the nets, glove-fasteners, ships' tackle, bed bottoms, and lawyers' bags out of the prior art. He would have continued to use the old shuttle in the old way. True, the patentee "struck" the process at once; but nothing unfavorable to him can be predicated of this fact. Indeed, the contrary is true. Many of the great inventions have come like a flash. The conception has been instantaneous, although the embodiment may have taken more or less time, according to the character of the invention. Such ideas, involving an entire change of methods, whether they come quickly or slowly, always come to inventors. They never come to mere mechanics. The invention is not a great one; but it would be a step backward for the court to hold that the ingenious process, which has done so much to advance the art of hammock making, only involves mechanical skill.

It follows that the complainant is entitled to the usual decree.

Coloring Photos.

Opaque colors may be applied to the background and drapery, but it is not wise policy to do so to the face, for fear of losing the likeness. Of course, an experienced painter may do what he chooses, using either opaque or transparent oils, but in these notes we are assuming the photographer to have only limited experience. The object of applying the coating of size will be evident. But for it, the oil would penetrate the paper and cause a stain.

When examining some matt Solio prints, it occurred to us that a surface of this nature would prove unusually excellent for the application of powder colors. Perhaps some of our readers may not be aware that colors of this class were used at one time in the coloring of daguerreotypes and collodion positives. They are said to have been prepared by the admixture of a little gum arabic in solution with the various pigments preferred for the purpose, and, after drying, repulverizing them to an impalpable powder and transferring them to small bottles. This, at any rate, was the way we prepared them when any special color was required not easy to be readily obtained, for in these days hinted at the preparation of powder color was in the hands of but few. Happily they can now be readily procured. A little of this on the point of a camel's hair pencil was applied to the daguerreotype with a swirling motion, and was fixed by breathing upon it. Beautiful effects were thus capable of being obtained.

We find that powdered colors, when applied to matt gelatine prints, form a ready means for imparting a seemingly elaborate coloring to a print, their application being made in a surprisingly brief period of time. When the superfluous powder has been dusted off, it would puzzle all but the initiated to tell by what means the color has been applied. If executed with judgment, the photograph has an appearance as if it had been carefully worked over by a skillful miniature painter, and, owing to the texture of the surface, the colors adhere with great tenacity. This is a method of tinting a print which we can very strongly recommend.—British Journal.

The Value of the Scientific American.

An esteemed subscriber, in renewing his subscription this year, writes as follows:

In your issue of January 20, 1894, you saw fit to quote me under the head of "The Value of the SCIENTIFIC AMERICAN." Let me give you a better authority. When one of the sons there mentioned was a freshman of A. A. University, mathematics came very hard to him, and along at first he was frequently "conditioned." He and I went to see President Angel, who replied: "The professor is easy on a boy that he thinks is doing his best; but very rough on one that he thinks is 'ponying.' I will see him about it. By the way, what papers have you been reading?" The boy replied, "Detroit Daily Tribune, Harper's Monthly Magazine, Phrenological Journal, and the SCIENTIFIC AMERICAN." President Angel replied, "I will trust any boy anywhere that reads the SCIENTIFIC AMERICAN."

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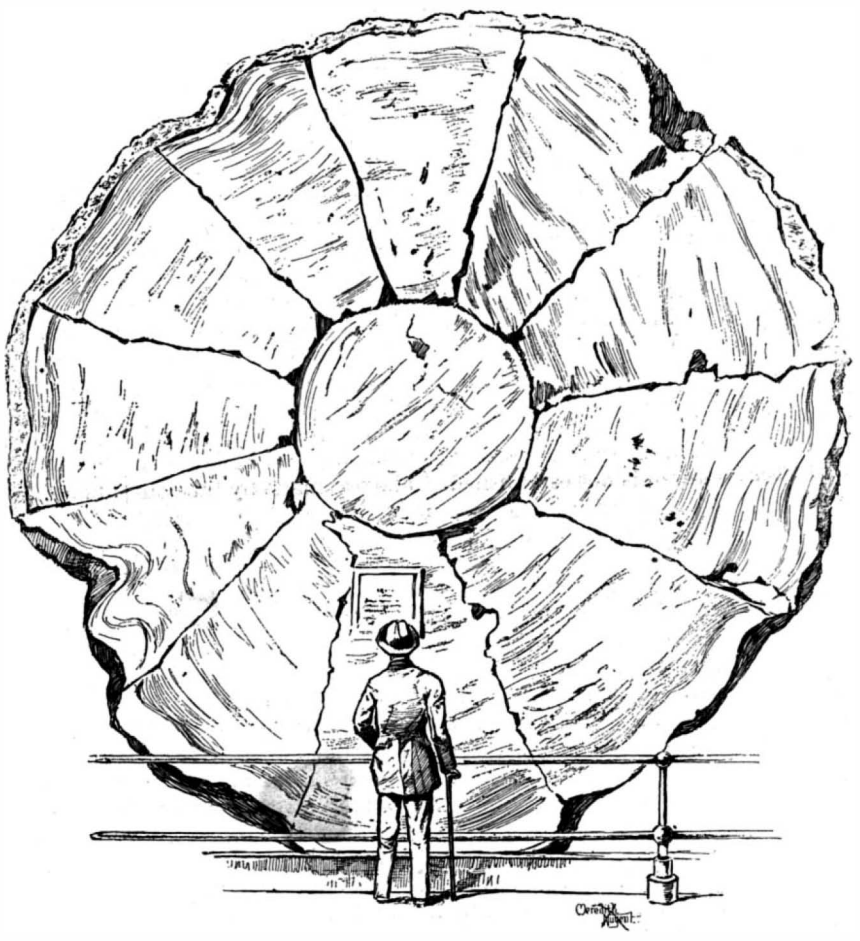
Ascent of Sap.

Dixon and Joly, in a paper recently read before the Royal Society, pointed out that Strasburger's experiments on the ascent of sap have eliminated the direct action of living protoplasm from the problem, and that the explanation thus remained to be sought in the tracheal tissue and the transpiration activity of the leaf. The ascent would appear to be principally in the lumen and not in the wall, and the stable condition of the ascending sap probably accounts for the transmission of the tensile strain without rupture of the column of liquid. The transmission of this tensile stress to the root would result in the rapid condensation of water from the surrounding soil by the capillaries of the root surface. The power possessed even by a root injured by lifting from the soil, of condensing water vapor from a damp atmosphere, was shown by experiment. A system, consisting of two porous pots connected by a tube, when filled with water enabled the authors to illustrate how the "leaf" exposed to the air gives off vapor, while the "root" buried in damp earth supplies the demands of the "leaf," and an upward current in the connecting tube is thus established, as in the case of the living plants.—Nature.

THE GIANT TREE MARK TWAIN.

This drawing was made from the great section of a giant tree now on exhibition in the Jessup collection at Central Park Museum. It is sixty feet in circumference and the appearance it makes in the great hall of exhibit is enormous. The tree was named after Mark Twain and stood three hundred and fifty-eight feet in height. At its base it was ninety feet in circumference. For one hundred and fifty feet it towered aloft without a branch, just a tall column.

It contained 400,000 feet of lumber. The specimen at the museum is perfectly marvelous, and when groups of people are standing before it, then one gets some idea of its enormous size, which figures do not give. It was brought to the museum at a great deal of expense and trouble, and unless I am mistaken, it is the only specimen on exhibition in the United States.



SECTION OF THE GIANT TREE MARK TWAIN—60 FEET CIRCUMFERENCE.

The Patent Laws Should be Liberally Construed.

The late Judge Joseph Holt was one of the ablest men who ever occupied the chair of Commissioner of Patents. In his various official actions he invariably gave evidence of his desire to encourage the inventor by a prompt and ready recognition of every point favorable to the application for a patent. Here is an extract from one of his decisions:

"It is due to the dignity of the subject and the generous spirit of the Constitution that the patent laws should be liberally construed, having ever in view the great end they were designed to subserve. They were enacted for the government of an office whose range of action is altogether above the barren fields of mere technicalities. That office, in my judgment, would be forgetful of its mission and disloyal to one of the highest interests of humanity were it to permit itself to be entangled in a mesh of mere words, or palsied by doubts born of intricate metaphysical disquisitions. It has to do with the substance of things and to deal with the earnest, ingenuous, practical intellect of the age, and it should deal with it frankly, not perplexing and discouraging inventors by subtile distinctions, but kindly taking them by the hand as the benefactors of their race, and strewing, if possible, their pathway with sunshine and with flowers."

Natural History Notes.

Production of Sounds by Insects.—While the notes of insects are among the loudest, and popularly supposed to proceed from the mouth, they are, in fact, instrumental—in other words, are produced by various musical instruments with which nature has endowed them, and yet which, to some extent, correspond to the voice of other animals, the sounds and calls being answered by others of their kind. When the grasshopper wishes to hail some companion or talk to its fellow over the fence, it simply rubs its thigh against the forewings, or plays upon a veritable fiddle. If the leg of the musician be examined under a microscope, a ridge of very fine teeth (the sound producers) will be seen.

The loudest players are the locusts, which often make the woods resound with their calls. Sometimes all are playing or chattering at once; again, there will be a lull in the conversation, then one will begin, the note will be taken up by another, and finally a volume of sounds will blend and fill the air.

In the former case we had a fiddler, but here the musician is a drummer, as we may ascertain by examining the locust. The base of the anterior wing is transparent, forming a regular drum, with which the males produce their calls; and as there are many different species, so there are many different calls, and some, it is said, have certain calls for the night and others for the daytime.

The cicada, by using a drum at the base of the abdomen, produces a remarkable sound, sufficient even to frighten off an enemy, yet a big wasp will sometimes carry off a big cicada despite the "zeeing" and drumming of the victim.

The notes of the katydid are perhaps as familiar as any, and have a certain fascination, the sounds taking on various inflections and meanings. They are produced through the rubbing of the inner surface of the hind legs against the outer surface of the front wings—through fiddling, in fact. When the male cricket sings on the hearth, it raises its forewings and scrapes them against its hind ones. Even the butterfly makes a sound audible at some distance, certain species having been heard to produce a clicking sound.

The Fall of Leaves.—According to Prof. Trelease, three more or less distinct periods are observed in the fall of leaves. The first period, which precedes the principal fall by about a week, is marked by the loss of the leaves of the small branches; during the second, the tree loses the majority of its leaves and preserves but a few isolated ones, situated in most cases upon branches that are protected during summer and gradually disappear in the course of the third period.

A writer in the Gardener's Magazine offers the following explanation as to the fall of leaves:

It seems strange that the fall of leaves sometimes occurs at the approach of cold and sometimes at a rise in temperature; but the heat and cold are merely secondary causes—the principal cause being the danger that the continuation of transpiration offers the plant. In autumn, the absorbing activity of the roots is so reduced by the low temperature of the earth that the water lost in consequence of the transpiration is compensated for with difficulty.

The fall of the leaves is prepared for by the formation of a special layer of what is called separating cells, which consists of parenchymous tissue, and the walls of which are so constructed as to permit of being easily destroyed under the influence of chemical or mechanical agents. As soon as the restriction of transpiration becomes necessary, these walls are dissolved by organic acids and the continuity is destroyed; so that the least breath of air suffices to produce a separation and cause the leaves to fall.

The Respiration of Leaves.—Messrs. Deherain and Maquenne, having demonstrated that the ratio of the volume of oxygen absorbed to the volume of carbonic acid emitted varies with the temperature, Mr. Maquenne continued the study of the respiration of leaves alone. He points out the curious fact that living leaves, after remaining a few hours in a vacuum, absorb more oxygen in the same time than they would have absorbed in the normal state. On another hand, he recognized, under the same circumstances, a notable acceleration in the disengagement of carbonic acid. Things occur, then, as if the leaves became charged, when protected against the air, with an oxidizable principle that rapidly burns as soon as it meets with oxygen. The two phenomena, however, are not proportional, and the ratio of the volume of carbonic acid emitted to that of the oxygen absorbed becomes modified after the action of the vacuum in a sense that seems to depend only upon the species of plant submitted to experiment.

The Brazilian Pottery Tree.—Among the numerous vegetable products of Brazil, the Moquilea utilis, or pottery tree, is not the least noteworthy. This tree attains a height of one hundred feet, and has a very slender trunk, which seldom much exceeds one foot in diameter at the base. The wood is exceedingly hard and contains a very large amount of silica, but not so much as does the bark, which is largely employed as a source of silica for the manufacture of pottery. In preparing the bark for the potter's use, it is first burned and the residue is then pulverized and mixed with clay in the proper proportion. With an equal quantity of the two ingredients, a superior quality of earthenware is produced. This is very durable and is capable of withstanding any amount of heat. The natives employ it for all kinds of culinary purposes. When fresh, the bark cuts like soft sandstone, and the presence of the silex may be readily ascertained by grinding a piece of the bark between the teeth. When dry, it is generally brittle, though sometimes difficult to break. After being burned, it cannot, if of good quality, be broken up between the fingers, a mortar and pestle being required to crush it.

Wax-secreting Organs of the Hive Bee.—In the production of wax, says Prof. C. V. Riley, the hive bee exhibits a lavishness not found in any of the wild bees, not excepting the species of Trigona and Melipona, which approach it most nearly in social economy. As a result, we find that the wax-secreting organs of Apis are much larger than in any other wax-producing bees.

In Bombus they are greatly reduced and otherwise different in structure, resembling, however, very closely those obtaining in Melipona and Trigona. In the solitary bees, which produce no wax, these specialized structures are entirely wanting. These solitary bees, no matter in what situations or of what material they make their cells, generally store them with honey or pollen, and after depositing an egg, cap the cell and leave the young larva to care for itself. The habits of the social bumblebee (Bombus) are but a step in advance, as the larvæ are developed in a mass of pollen and honey, in which they form rather imperfect cells. When full grown each spins a silk cocoon which is thickened by a certain amount of wax, which is added by the adult bees. The females labor, and several co-operate in the same nest. In the bottle bees (Melipona) a still further step is seen, as the cells, of a rather dark, unctuous wax, are formed into regular combs and are somewhat imperfectly hexagonal.

They are, however, in single horizontal tiers, separated and supported by intervening pillars, more like the nests of the social wasps, and the cell is sealed after the egg is laid upon the stored food, just as in the case of solitary bees. The honey is stored in separate flask-like cells, and but one queen is allowed to provide eggs.

Prof. Cayley.

Prof. Arthur Cayley, Sadlerian professor of pure mathematics at Cambridge University, England, passed away at his home in Cambridge, January 26, at the age of 74. He was born in Richmond, Surrey. His father was a St. Petersburg merchant and his mother was a Russian. It is probable that Prof. Cayley inherited his great facility for learning languages from his mother, as the Russians are remarkable linguists. He entered Trinity College, Cambridge, at the age of 17, and graduated as senior wrangler in 1842. After leaving the university he began the practice of law, in which he was very successful. He had always had a passion for mathematics, and devoted every hour that he could spare from his profession to its study. When Lady Sadler endowed a professorship of mathematics in the university, the brilliant young lawyer gladly left his lucrative profession for the pursuit of his favorite science. Prof. Cayley's fame rests chiefly on three great discoveries. He first elucidated the theory of variants. His other discoveries were the theory of the absolute, an infinite geometrical quantity upon which all measurements are based, and the theory of matrices, which is a further advance on that of invariants. Prof. Cayley wrote an immense number of mathematical treatises, of which the best known is probably that on "Elliptic Functions." The death of Prof. Cayley will be deeply felt in Cambridge, where he was greatly beloved, and the university itself will suffer great loss in the death of the eminent mathematician.

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The Solidified Sodium Lakes of Wyoming.

At a recent meeting of the London Section of the Society of Chemical Industry, Professor Attfield read the paper which his son, Dr. Harvey Attfield, had prepared. The investigation of which this paper was the outcome was undertaken in 1891, the primary object being a report as to the extent and character of a deposit of sodium sulphate, for the guidance of a syndicate ere it should embark in a pecuniary venture. Information respecting the average chemical composition of the deposit, the quantity, the presence or absence of sand, fuel and water, as well as the facilities for transit and the character of the district from a hygienic point of view, in case a factory should be established on the spot, were all points requiring attention. The precise locale of the lake was indicated on a map of Wyoming State. It occurs in the "oil district" which traverses that State in direction N.E. and S.W., and lies a short distance from one of the outlying spurs of the "Rockies," a distance of some sixty miles from the nearest railway station.

The solidified lake has a snowy appearance, due to the pulverulent sodium sulphate which rests on the surface; the longest diameter is 1,200 yards, and the reputed area 110 acres. Investigation showed, however, that by far the larger portion of this area is surface without any substratum, and the actual workable area was reduced by a series of borings to six acres; this discovery at once negatived the idea that the lake could be profitably worked by capitalists, for the glass industries of Pittsburg alone would speedily consume the whole of the available sodium salt capable of being excavated from a ten acre lake.

The salt is practically anhydrous Glauber salt with about 6 per cent of Na_2CO_3, 1·5 per cent NaCl, and 6·9 per cent water of crystallization, slight differences being perceptible according as the sample was taken from the upper or lower portion of the bed. The lake rested on a bed of stiff tenacious clay, and this fact is believed to furnish the key to the problem why these deposits are found in these districts. The "weathering" of certain "spars" or spathic rocks is always going on, and as the winter snows melt, the soluble matters are removed; if, instead of finding an outlet seaward, the salt-charged water drains into a lake with a more or less impervious bottom, natural evaporation goes on, and the salt, freed from its insoluble contaminations, is deposited.

The other lakes visited (for there were three close together) are situated about twelve hours' railway ride from Denver, and have already been described by Pemberton and Tucker, 1888. These lakes have also been worked for industrial purposes, and a 6,000 inch block of sodium sulphate was quarried here and forwarded to the Philadelphia Exhibition in 1876. A sample of the crystallized sulphate assayed more than 99 per cent, and the layer is asserted to be 30 feet thick. An adjacent lake, termed "Red Lake," exhibits a reddish tint in places, which, it is believed, is derived from a low form of life. A similar coloration has been noticed in certain lakes in Egypt, where sulphureted hydrogen was found to be given off, and with apparent benefit to the vegetable organism. Dr. Attfield made a similar observation in the Wyoming "Red Lake;" this salt lake was veined by vertical layers of a soft black mud, which evolved sulphureted hydrogen freely when stirred.

Science Notes.

The Souchard Field Glass.—A powerful binocular glass for determining the exact distance of an object from the observer has recently come into use in the French army. It is called the Souchard field glass. When the glass is in focus, there are interposed by means of the fingers, between the eye and the object, two prisms of Iceland spar. Then there are immediately brought into the field of vision two images, one of the real object and the other a smoky facsimile directly in a line with and at the rear of it. The second image is more elevated, since the distance is greater. The object that serves for the adjustment of the glass as used in the French army is either a soldier of ordinary stature or one on horseback. If the head of the real image reaches to the shoulder of the facsimile, he is distant just 300 meters; if to the waist of the image, 600 meters; and if to the knees, 1,000 meters. If the feet of the image apparently rest upon the head of the soldier, the distance is exactly 1,400 meters. If there is a space between the feet of the one and the head of the other, the distance can be only approximately determined.

Production of Ozone.—According to foreign chemical journals, the most recent method of producing ozone is that of Lieutenant Poulsen, a Danish officer, and is based upon the oxidation of phosphorus in a special apparatus. A wide-necked glass jar is closed with a finely perforated porcelain plate, and two inches below this there is a similar plate inside the jar. Through the center of each passes a rod, which is curved upward at the lower end and terminates in a small cup for holding a piece of phosphorus. The jar contains sufficient acidulated water to submerge the phosphorus when the apparatus is not in use, and, when ozone is required, a small quantity of potassium permanganate is added to this, and the phosphorus raised by means of the glass rod above the surface of the liquid. Phosphorous acid is formed by contact of the phosphorus with the air, and converted into phosphoric acid by the action of the permanganate, while ozone is produced simultaneously and escapes through the perforations in the porcelain plates.

Asbestos Filter.—A novel and ingenious filter described in the Bulletin of the Societe de Pharmacie du Sud-Ouest is said to be free from many of the disadvantages of filters made of paper, felt, etc. It consists of a covered tinned copper cylinder, below which is fixed an inverted cone of very fine wire gauze, and the whole is supported on an ordinary funnel stand. The liquid to be filtered has a small quantity of powdered asbestos suspended in it, and is then poured into the cylinder. The asbestos forms a filtering layer upon the wire gauze, and the liquid passes through perfectly clear. The wire gauze is afterward washed with water, and is then ready for further use. The apparatus is said to have been used to advantage for filtering sirups, decoctions, infusions, distilled waters, etc., with a saving in both time and material.

Preparation of Ores by Dry Way.—The mechanical separation of the materials composing ores is frequently effected by wet way, a method in which the property possessed by the consecutive materials of having different densities is utilized. This method, however, presents certain inconveniences, and, in order to suppress these, says L'Industrie, Mr. Pape Henneberg has devised what he calls the dry process. It consists essentially in crushing the material; in projecting, through the centrifugal force generated by a swiftly revolving disk, the ore reduced to a powder by a regulatable current of air; in uniting, by sifting, the products derived from the centrifugal projection; and in finally concentrating upon tables, and by dry way, the dust sucked up by an exhauster.

Method of Welding Horn.—Horn, which is often used as a cheap substitute for tortoiseshell in the manufacture of various objects, has the inconvenience of breaking quite easily, and attempts to mend articles made of it are not always successful. The Chronique Industrielle offers the following process: After having sufficiently heated the horn over a fire, the edges of the two pieces are beveled by scraping, in such a way that an accurate joint shall be formed. A pair of hot pincers is then applied to the line of junction, which should be slightly moistened. The joint is finally finished with a scraper and tripoli. This process, unfortunately, is not applicable to tortoiseshell.

Electrolysis of Sea Salt.—Extensive works says Le Genie Civil, have recently been established at Oldbury, near Birmingham, for the electrolytic preparation of chlorine and caustic soda from sea salt.

The elementary apparatus is a pan about six feet in length, three in width, and six inches in depth, divided into three longitudinal compartments by partitions which do not touch the bottom. To these receptacles there is given a continuous slight horizontal motion in order to cause the circulation of a layer of mercury which covers the bottom. In the lateral compartments there is a saturated solution of marine salt, which is continuously renewed, and into which enter anodes of compressed carbon. A lead cover closes the compartments and communicates through a special piping with a collector, which leads the chlorine to the places where it is to be used.

The central compartment is provided with iron cathodes, and in it there circulates a continuous current of water, which carries the caustic soda to a concentration of about 20°.

The electrolytic pans having been connected in series, there is sent into them a current of 550 amperes, with 4 volts to each pan. Under the action of this current, the chloride of sodium is decomposed. The chlorine, mixed with traces of hydrogen (from 3 to 5 per cent, on an average), is sucked up by aspirators, while the sodium dissolves in the mercury, forming a cathode. The amalgam of sodium is decomposed, in turn, in the central compartment, the sodium reacts upon the water and becomes converted into caustic soda, and this action produces a strong electric current which is added to the general current. Up to the present no effort has been made to collect the hydrogen.

The solution of caustic soda is kept at a density of about 20 per cent, and in this state is sent to evaporators, where it is concentrated into blocks that contain 99·5 per cent of pure caustic soda.

The establishment contains 30 pans, which permit of the daily production of 1,300 pounds of caustic soda and 1,100 of liquid chlorine.

The French Academy.—Some very interesting statistics have been compiled in connection with the two hundredth anniversary of the foundation of the French Academy. The original academicians, thirty-five in number, received, on January 2, 1635, letters patent from Louis XIII., and the institution, planned by Cardinal de Richelieu, was practically founded. The Parliament, however, became jealous of the establishment of a powerful literary corporation in the state, and for two years refused to acknowledge the royal letters patent. In 1793, the academy received another blow from the politicians, as it was suppressed by the Convention. It was reorganized in 1816. The forty seats have had 475 occupants since the foundation of the institute. The seat of Gaston Boissier, who has been an academician since 1876, is that which has held the smallest number of "Immortels." Mr. Boissier's predecessors, beginning with De Bourzays in 1635, were only seven in number. They enjoyed their chairs for an average of thirty-four years. The seat which death has most frequently visited is the one now occupied by the Franco-Cuban sonneteer Mr. Jose Maria Heredia. This immortal had fifteen predecessors. The dean of the academy is Mr. Ernest Legouve, poet, novelist, playwright, lecturer, and authority on fencing, who is nearly eighty-eight years of age, and who entered the institute as far back as 1855, when he succeeded Ancelot.

Electricity in Dentistry.—According to Nature, trials have been made in London of a new apparatus for extracting teeth by electricity. It consists of an induction coil of extremely fine wire, having an interrupter capable of vibration at the rate of 450 times a second. The patient sits in the traditional armchair and takes the negative electrode in his left hand and the positive in his right. At this moment the operator turns on a current, of which the intensity is gradually increased till it has attained the utmost limit that the patient can support. The extractor is then put in circuit and fastened on the tooth, which, under the action of the vibration, is loosened at once. The operation is performed very quickly, and the patient feels no other sensation than the pricking produced in the hands and forearms by the current.

A Tunnel Under the City of Baltimore.

The Baltimore & Ohio Railroad is preparing a gigantic coup that will draw Washington and New York nearer together by forty minutes. This is the new $8,000,000 tunnel under the city of Baltimore, by which the transportation of cars across the river at Baltimore will be obviated. For many years the Pennsylvania road sublet a part of its road, including an entrance to the largest Baltimore station, for a handsome sum, to the Baltimore & Ohio. But the rival road began to cut so deeply into the Pennsylvania's business that it came down hard on the Baltimore & Ohio and refused to renew the lease. Shut out of Baltimore, and cut off as far as the Susquehanna River, it looked as if the Pennsylvania had forever disposed of the Baltimore & Ohio as a rival for its New York line. But the Baltimore & Ohio pluckily built its own tracks from Baltimore to the Susquehanna, across which it threw a splendid iron bridge. It was enabled to take a more direct route than the Pennsylvania road, and so cut off sixteen miles of distance, which the Pennsylvania has made no effort to discount, as it would cost millions. The Baltimore & Ohio trains had then to be taken across the river at Baltimore, but even with that disadvantage it landed passengers at the foot of Liberty Street, in New York, exactly five hours from the moment of starting from Washington. Meanwhile, the $8,000,000 tunnel was begun under the city of Baltimore, and within a few months it will be open for traffic, when the Baltimore & Ohio will leave its competitor exactly forty minutes behind in the race to New York, with no prospects of shortening the difference between them. There has been a good deal of secrecy maintained about this tunnel, the Baltimore & Ohio people having determined on a great stroke when it is opened. Nobody is allowed to write it up, and all inquiries are met with polite evasions, which tell nothing except that they are building a tunnel which will some time or other be finished. It is, however, declared by the Boston Transcript that it is considerably nearer completion than the officials will let on—and it is certain that four hours and twenty minutes will take a train through from Washington to New York, with a strong probability of the lopping off of the odd twenty minutes.—Philadelphia Press.

How to Make an Engineer.

Speaking at meeting of the Leeds Association of Engineers, on the 1st December, Mr. W. Clayton, M. Inst. C.E., who presided, said that we were told we were not to compete with foreign rivals, because Continental people had superior technical education. It was nothing of the kind. Continental nations were able to compete with us because they could supply at lower prices, and that, in turn, was because men worked longer hours for less money. Technical education was a good servant, but a bad master, and conducted on the lines at present pursued in this country, would lead to nothing but disaster. It was no use sending a lad for three years to a technical school, and then at 19 or 20 giving him a few months' experience in a work shop. To make a good engineer, the good old plan of apprenticeship must be adopted. Let a boy get used to his work, and then let him learn, what he could never do at a college, business habits. This was the only way to make an engineer, and no other way would be successful.

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RECENTLY PATENTED INVENTIONS.

Railway Appliances.

SWITCH WORKER.—Frank Wood, Middletown, N. Y. This is a simple apparatus for use in connection with the ordinary switch lever and signal post, to be operated by a passing train to automatically close and open switch, the mechanism also shifting the signal post to indicate safety. The switch is normally held closed by a spring-pressed switch bar having a shoulder adapted to engage the horizontal member of a pivoted spring-pressed bell crank to hold the switch open, while a convex spring contact bar has one end pivoted adjacent to one of the rails and its other end connected to one of the cranks of a transverse shaft, a rod connected to the vertical member of the bell crank being also connected to one of the cranks of the shaft.

CABLE GRIP.—Michael F. Robinson, New York City (No. 42 East 105th Street). This is a cross cable grip at angles, of very simple and inexpensive construction, and conveniently applied. It permits of the passage of a cross cable through the carriage of the grip without interfering with or checking the progress of the car, and without detracting from the support which the carriage should give to the grip, or the connection between the carriage and the car. The jaws of the grip have a substantial serpentine bite, holding the cable by compression, and the jaws may be conveniently opened or closed by the gripman on the car, the cable being simply released or entirely discharged by means of the same shifting device.

CAR CONSTRUCTION.—Benjamin F. Allen, Mobile, Ala. This invention relates more particularlarly to car axles and the manner of hanging them, providing a two-part axle so hung that in rounding a curve the wheels will swivel slightly in relation to each other to follow the rails without friction, the wheels being placed near the ends of the car if desired, and thus obviating the tendency of the car to rock. The two-part axle is journaled and pivoted in a frame on which is pivoted a lever whose ends are connected by rods with the inner ends of parts of the axle, and when the car rounds a curve the wheels move in true concentric circles, the inner ends of the axle sections swinging slightly in opposite directions, but returning to normal position, through the action of the levers and springs, when the car strikes the straight track.

RAIL JOINT.—Martin Hubbell, Mount Kisco, N. Y. This is an improvement on a formerly patented invention of the same inventor, a base plate notched on the edges supporting the rails at the joint, in connection with two fish plates, while clamping plates impinge the side of one of the fish plates and pass loosely through the notches of the base plate, and bolts clamp the parts together, passing through aligned holes in the rail webs, fish plates, and clamping plates. Hook-headed bolts bind the base plates on the rails. It is claimed that this joint not only prevents lateral deviation of the rails, but is measurably elastic.

CAR FENDER.—Adelbert L. Reynolds and David A. Center, New York City. This device, for picking up without injury persons in the path of a car, consists of a horizontally slidable platform in combination with inclined guides rigidly supported from the truck frame. The fender has at its front end a series of springs, each with curved or rounded front portion terminating in a longitudinal top part, with free rear end to permit the spring to readily yield on striking an obstruction, and to lift the latter.

CAR COUPLING.—Andrew D. Alden, Brockport, Pa. This is a coupling of the link and hook type, having parts adjustable for coupling or uncoupling from either side of the car. In the link-receiving recess of the drawhead is pivoted a latch hook having a depending nose adapted to engage the coupling link when the latter is in place in the drawhead, while a gravity link pivoted to the latch hook is adapted normally to lock the latch hook against movement, a lifting device being connected with the link for lifting and unlocking the latch hook.

Electrical.

TELEPHONE TRANSMITTER.—William A. Mason, Sumter, S. C. This is an improvement in transmitters in which one or more carbon pencils or bars hangs or leans from gravity against another carbon bar or pencil, the latter attached to the vibrating diaphragm and forming one terminal of the circuit, while the gravitating pencils or bars form the other. The leaning bars, according to the improvement, are made with a hole through which passes the other carbon electrode, the hole being reamed out on both sides to form a sharp circumferential edge at the point of contact, whereby extreme sensitiveness for low tones is obtained without any jarring or confusion of sounds in the louder tones.

Mechanical.

ROLL POLISHING DEVICE. — Charles and John L. Greer, New Castle, Pa. This is a device more especially designed for smoothing the surfaces of rolls employed for rolling sheet metal plates, the rolls not having to be stopped and the process being adapted to both hot and cold rolls. It consists of a tapering tongue adapted to be projected between the rolls, and made in separate sections, with independent means of adjustment, the bearing surface consisting of an elastic cushion covered by a surface of metal.

LEVELING DEVICE.—James Darragh, New York City. This is a device for use in machine shops, and by bridge builders, carpenters, masons, and other mechanics, for conveniently leveling in places a considerable distance apart, without the use of straight edges or other tools. It comprises two indicators, consisting of graduated glass tubes connected by a flexible tube containing a liquid whose rise and fall in the glass tubes indicate the difference of elevation. On the upper end of each tube is a ring for conveniently suspending each indicator from an article, such as shafting, etc., and on the base of each indicator is a spirit level, while a graduated rod indicates the distance of the base from the object being leveled.

Miscellaneous.

RUBBER TREATING APPARATUS. — Francisco G. P. Leas, New York City. For treating rubber and similar vegetable juices, which coagulate when acted upon by certain gases, this inventor has devised a simple apparatus for forcing the gas through the material to be treated, to produce a homogeneous coagulated mass, the apparatus avoiding the loss of gas and preventing the contamination of the material by foreign matter. The coagulating chamber is connected with a bellows provided with means for supplying gas from a holder, and in the chamber is operated a plunger to bring the gas or smoke for the coagulating of the material in contact with its inner particles.

CISTERN.—Henry P. Schaefer, Schulenburg, Texas. This is a sheet iron upright cylindrical cistern, and applied around its upper open end is a strengthening rim of wrought iron or steel metal tubing or piping, which is fastened to the cistern and arranged preferably around its outside. A similar strengthening rim is also applied if desired at different places around the body of the cistern, the pipes or tubes, being always readily obtainable, giving great strength, and being bent and applied with comparatively small expense.

THILL COUPLING.— James T. Welch and David A. Dreyfus, L'Argent Landing, La. This device comprises an axle clip having forwardly projecting parallel lugs with notches in their upper edges, a latch b ing pivoted on and having a crossbar to swing over the ends of the lugs, and the side arms of the latch having notches to register with the notches in the lugs. The device is simple and inexpensive, does away with the use of bolts, holds the thills securely, and facilitates instant coupling or uncoupling.

ICE CREAM FREEZER. — Giuseppe Ottino and Antonio Raffo, New York City. This freezer comprises a cylinder turning in an ice box, there being within the cylinder an air blast chamber connected with an air supply, and a perforated plate in close proximity to the rim of the cylinder. A liquid supply pipe discharges over the plate and a scraper arranged through the cylinder engages the inner surface of the plate to scrape off what freezes on its surface. Cream or other liquid is quickly frozen by the action of the air blast, dividing the cream into fine particles and passing it on to the cold revolving cylinder.

CLOCK STRIKING MECHANISM.—Oscar G. Ahlstrom, New York City. This is an improvement in automatic gongs for use in lodge rooms or other places where special signals are to be sounded, facilitating the sounding of a predetermined number of alarms at certain distances apart. When the alarm is required a push button is pressed and a starting arm controlling the striking mechanism is turned, its stop attachment releasing a wheel which sets all the gearing in motion.

SASH FASTENER. — George W. C. Woolery, Bedford, Ind. In each side of the sash, according to this improvement, is embedded a metallic strip or detent plate, with bottom curved cavities, permitting the horizontally moving bolt of a sash lock in the sash to slide from one recess to another, against the tension of spring, the spring being of sufficient strength to maintain the bolt in outer position against the weight of the sash. The outer ends of the bolts are slightly rounded to permit the sash to be readily moved up and down, and the arrangement of the lock is such that the tensional force of the spring may be readily increased. A key is provided by which the bolt may be locked in outer position to hold the sash closed or at any desired elevation.

METAL FRAMED MIRROR. — Albert Wanner, Jr., Hoboken, N. J. This inventor has devised an improved circular mirror, of inexpensive but quite ornamental construction, for toilet use. The frame is preferably a sheet metal strip, semicircular in cross section, with ornamental joint cover pieces at its ends, the frame inclosing the beveled edges of the glass as the ends of the frame are drawn together. The handle piece is a metallic bar or length of wire made to simulate strung beads, and the mirror has an ornamental reverse facing piece covering and protecting its silvered surface.

TIP CAP FOR UMBRELLA RIBS.—Alfred B. Hunt, Brooklyn, N. Y. This is a cap of elastic material with slotted spring metal body and enlarged head, to be applied to the outer extremity or tip of each rib, in order that covers with such tips attached may be kept in stock in furnishing and other stores for ready application by customers to old umbrella frames.

UMBRELLA OR CANE RACK.—Albert J. and Harry S. Grimes, Portsmouth, Ohio. Upon the upper end of a standard supported by a suitable base is a revolving hub with radial arms on the opposite sides of which are double spring clips, there being hooks on the arms above the clips, and the clips and hooks being numbered. For each hook is a numbered check, to be passed to any one whose umbrella or cane is placed in the rack.

CIGAR CASING.—Nathan Schwab, New York City. This is a cheap protecting casing, of glue, celluloid, paper, or other suitable substance, the casing being made in two parts, to cover the two ends of a cigar and leave an exposed middle portion. It is designed to be cheap enough to be thrown away when the cigars are consumed, but to afford such protection that individual cigars may safely be carried in the pocket, while the open middle portion allows one to judge of the color and quality of cigars thus protected while they are in the boxes.

FISHING NETS.—Harald Hommerberg, Brooklyn, N. Y. An apparatus for closing and hauling nets or seines, without pulling the nets on shore, and without danger of losing the fish, has been devised by this inventor. At the lower edge of the net is a block line held on a flap, a weight block having a slidable connection with the block line, while a weight line is connected with the block for hauling it in. In hauling in the net the anchor lines are slackened, and the net is closed after the fish are entrapped, without leaving the fishing ground.

MOUSE TRAP. — Henry Obermeyer, Jansen, Neb. This trap consists of a cage with a pivoted gate or door in its front wall, in connection with a weight-lifted hood, while a vertically movable platform is so connected to the gate and hood as to be depressed by the weight of the animal.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

AN HISTORICAL SKETCH OF MADISON SQUARE, NEW YORK CITY.

Marcus Benjamin has edited for the Meriden Britannia Company an illustrated monograph, descriptive of the square and its surroundings half a century ago, and the statues of distinguished persons, and fountains within the park and the beautiful buildings which now surround it.

POPULAR SCIENTIFIC LECTURES. By Ernst Mach. Translated by Thomas J. McCormack. Chicago: The Open Court Publishing Company. 1895. Pp. 313. Price $1.

These lectures extend over a considerable ground in natural science. They are translated from the German. The author's views are more or less one-sided, he advocating a greater devotion to science and less to the classics.

The 1895 Catalogue of the Keuffel & Esser Company, of New York, is a model in its way. The company are large manufacturers and importers of drawing materials and surveying instruments, and their catalogue fills over 400 closely printed pages, this year's issue being the twenty-sixth edition, greatly enlarged, revised, and rewritten. The book is copyrighted entire, and some four hundred of its illustrations and much descriptive matter have also been separately copyrighted. The number of kinds and grades of drawing paper shown, the great variety of instruments and sets of instruments, and all related appliances, would seem to amply justify the assumption of the company that nothing in their line which is good and reliable has been omitted. There is also a good deal of valuable and instructive matter in the text. The catalogue should be in the hands of all users of or dealers in such goods.

SCIENTIFIC AMERICAN BUILDING EDITION.

JANUARY, 1895.—(No. 111.)

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1. An elegant plate in colors, showing a Colonial cottage at Williamsbridge, N. Y., recently erected for Chas. H. Love, Esq. Two perspective elevations and floor plans. Cost complete $4,250. Mr. Arthur C. Longyear, architect, New York City. A pleasing design.
2. A Colonial residence at New Rochelle, N. Y., recently erected for J. O. Noakes, Esq., at Iselin's Park. Two perspective elevations and floor plans. Cost $5,000 complete. Mr. Manly N. Cutter, architect, New York City. An attractive design.
3. Colonial residence at Montclair, N. J., recently erected for Sylvester Post, Esq. Two perspective elevations and floor plans. Messrs. W. S. Knowles & A. H. Thorp, architects, New York City. A pleasing design.
4. A seaside cottage recently erected for C. H. Manning, Esq., at Kennebunkport, Me. Two perspective elevations and floor plans. A picturesque and unique design after the "New England" lean-to roof order. Mr. H. P. Clark, architect, Boston, Mass.
5. A residence at East Orange, N. J., erected at a cost of $7,000. Architect Mr. W. F. Bower, Newark, N. J. Perspective elevation and floor plans.
6. The First Presbyterian Church at Stamford, Conn. Two perspective elevations and ground plan. A design of great architectural beauty, treated in the Romanesque style. Mr. J. C. Cady, architect, New York.
7. A residence at Scranton, Pa., erected for E. B. Sturges, Esq., at a cost of $5,000 complete. Architect Mr. E. G. W. Dietrich, New York City. Perspective elevation and floor plans.
8. A summer residence at Cushing's Island, Me., recently erected at a cost of $3,100 complete. Two perspective elevations and floor plans, also an interior view. Mr. John C. Stevens, architect, Portland, Me An excellent example for a summer home.
9. View of the Armory of the Seventy-first Regiment, New York City. Architect Mr. J. R. Thomas, New York City.
10. Perspective view and floor plans of the fourteen story Reliance Building, Chicago.
11. Miscellaneous contents.—Buff brick popular.—Ceiling and cornice tinting.—Home ground arrangement of plants, illustrated.—Stone dressing by compressed air, illustrated.—Brick dust mortar.—Interesting ruin of cliff dwellers.—Removing the front wall of a warehouse, with sketches.—Improved woodworking machine, illustrated.—Buff brick in New York.—Ceiling paper.—"Dec-co-re-o," a new material for decorative purposes, illustrated.—Improved gutter hangers, illustrated.—Draughtsman's supplies, illustrated.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(6392) The H. E. S. Co. write: A few years ago a portable electric light (so called) was advertised and sold through the country, the production of light being caused by heating, in the flame of a small alcohol lamp, a small spiral of very fine wire through which passed a current from a medium sized Grenet battery. What metal was the spiral? This was quite a novelty at the time, producing as it did a brilliant, soft light for a limited time at intervals. A. The wire was probably platinum. The heating in the flame not only helped the incandescence directly, but also increased the resistance, so that a thicker wire could be used than one required for the battery alone.

(6393) S. N. asks: 1. How thin can I use the wire for a line 100 feet long able to conduct an electric current (under water) strong enough to give a spark at the end of the line? I want it as flexible as possible. What kind of insulation is the best? A. Use gutta percha insulated wire No. 24. 2. Would it not be the best to use a spark coil to obtain the necessary tension? A. Yes. 3. Could the coil be placed near the battery or must it be at the end of the line? A. Place it anywhere. 4. How many cells of standard dry batteries would be required? A. Six or eight.

(6394) F. J. M. asks: 1. What number wire is used in common electric bells? A. No. 22 to 24 is a good size. 2. Is wire double covered? A. It is best so; not necessarily. 3. How many layers are employed on spools? A. Nine or ten are enough. 4. What other metal besides platinum is suitable for contact breaker? A. Platinum is most available. Iridium is excellent.

(6395) W. W. S. asks: 1. What is meant when a water main is said to be negative to a rail in a track above it? A. When in electrolysis hydrogen would be evolved from it. 2. To prevent or reduce electrolysis of water pipes, should the pipes be positive or negative to the rail, and why? A. Negative, because oxygen is the corroding element.

(6396) E. Y. M. asks: 1. Can electric light carbons be pulverized and reshaped for battery purposes? If so, how can it be done? A. The best way is to solder or clamp them together. See SCIENTIFIC AMERICAN, October 27, 1888. 2. What make of incandescent lamps gives the best satisfaction? A. There are a number of equally good qualities. 3. What is the best size of wire for the primary coil in an induction coil having three of No. 36 wire in the secondary coil? A. Use two layers No. 16 wire. 4. How much battery power would be required to get the longest possible spark from above coil? A. Four amperes.

(6397) F. C. M. writes: I have a regular magneto call bell with telephone receiver attached to binding posts at side. It has four wires extending below the box. Now I wish to attach another receiver to be used as a transmitter. Which wires shall I connect my transmitter to? A. Connect your second telephone either in parallel or in series with the first. It makes little difference which way you connect it.

(6398) E. W. S. says: I send a stereoscopic view which is a puzzle to me, and if convenient

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for you I should be pleased to have you explain it. When I look at this view through a stereoscope, objects which should be in the foreground appear to be in the background and vice versa, and several persons to whom I have shown the picture see it in the same way. This peculiarity is particularly noticeable in the case of the trees in the background, which show above the canopy and appear through the stereoscope to be nearer the observer than the canopy is, and in the back of the canopy itself, which appears to be between the observer and the people who are sitting in front of it. By examining the picture through a stereoscope you will undoubtedly notice these things, and I should be glad to have you throw some light on the subject. A. The appearance is due to the fact that the print was not cut in two and the prints transposed, as must always be done in mounting stereoscopic photographs. See SCIENTIFIC AMERICAN, November 5, 1892.

(6399) Subscriber asks: Can I run two incandescent lamps (16 candle power) with a battery, or a number of batteries, and if so, whose make of batteries and how many of them? If it is practical to light two lamps with electricity from batteries, how would the cost compare with two Hitchcock lamps run the same number of hours, with kerosene oil at 45c. per gallon? A. Electric lighting on a small scale cannot be made to compete with kerosene. Electric lighting by means of primary batteries is both expensive and troublesome. Where it is done by secondary batteries charged by primary batteries it is somewhat less troublesome, but still expensive. See correspondence column this week for general arrangement of primary and secondary batteries. It will require 9 or 10 cells of secondary battery to run one 16 candle power lamp, but the same battery would run 8 or 10 lamps for a shorter time.

TO INVENTORS

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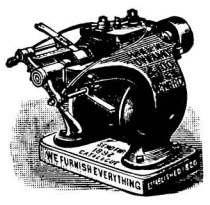

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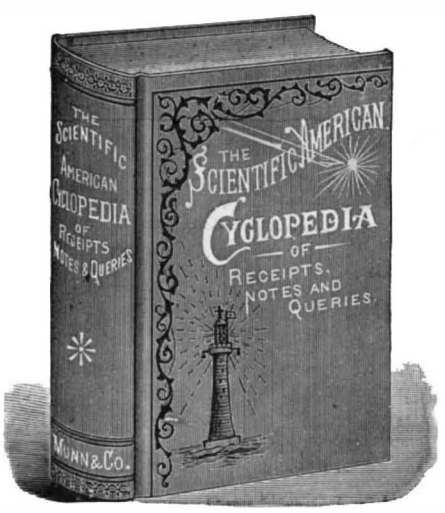

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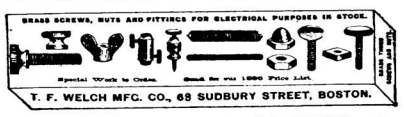

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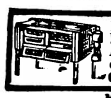

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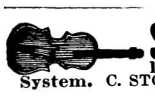

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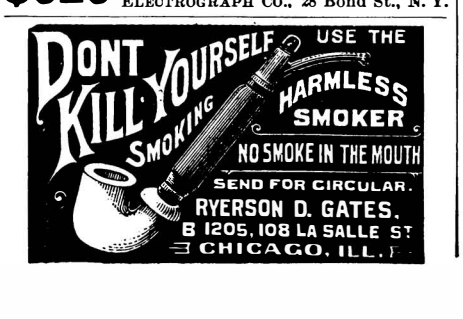

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CITY CLERK'S OFFICE,
BAYONNE, N. J., January 25, 1895.
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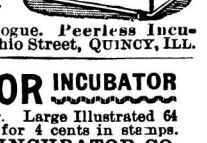

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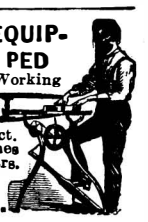

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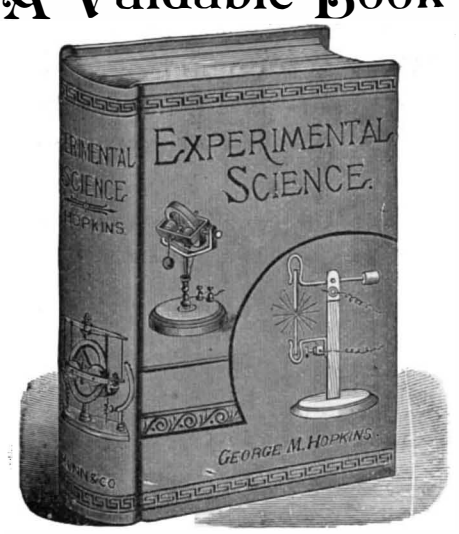

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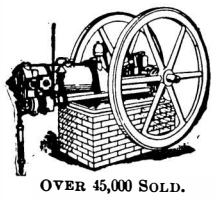

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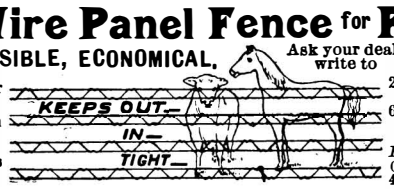

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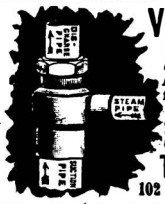

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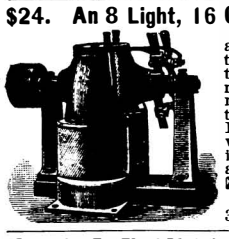

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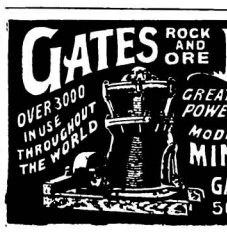

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